IN-DEPTH SURVEY REPORT

CONTROL OF ANESTHETIC GASES IN DENTAL OPERATORIES

AT

University of California at San Francisco
Oral Surgical Dental Clinic
San Francisco, California

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INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) is the primary Federal agency engaged in occupational safety and health research Located in the Department of Health and Human Services (DHHS), it was established by the Occupational Safety and Health Act of 1970 This legislation mandated NIOSH to conduct a number of research and education programs separate from the standard setting and enforcement functions carried out by the Occupational Safety and Health Administration (OSHA) in the Department of Labor An important area of NIOSH research deals with methods for controlling occupational exposure to potential chemical and physical hazards The Engineering Control Technology Branch (ECTB) of the Division of Physical Sciences and Engineering has been given the lead within NIOSH to study the engineering aspects of health hazard prevention and control

Since 1976, ECTB has conducted a number of assessments of health hazard control technology on the basis of industry, common industrial process, or specific control techniques The objective of each of these studies has been to document and evaluate effective control techniques for potential health hazards in the industry or process of interest, and to create a more general awareness of the need for or availability of an effective system of hazard control measures

These studies involve a number of steps or phases Initially, a series of walk-through surveys is conducted to select plants or processes with effective and potentially transferable control concepts or techniques Next, in-depth surveys are conducted to determine both the control parameters and the effectiveness of these controls The reports from these in-depth surveys are then used as a basis for preparing technical reports and journal articles on effective hazard control measures Ultimately, the information from these research activities builds the data base of publicly available information on hazard control techniques for use by health professionals who are responsible for preventing occupational illness and injury

In October 1986, NIOSH researchers began an evaluation of dental operatories which use scavenging systems This evaluation had two goals (1) to determine if there are scavenging systems which will reduce waste nitrous oxide (N_2O) levels in dental operatories to the NIOSH Recommended Exposure Level (REL) of 25 ppm during the time of administration, and (2) if such systems do not exist, then to determine why they fail to meet the NIOSH criteria and provide recommendations on how this criteria can be met (Note that waste N_2O will be referred to as N_2O in the text from this point on)

The purpose of this report is to present the results of the investigations of the function and uses of the Porter-Brown and MDT McKessen Scavenging Systems

to control N_2O to NIOSH Recommended Exposure Levels (RELs) during dental surgery

DEVELOPMENT AND USE OF NITROUS OXIDE IN CONSCIOUS SEDATION

For more than 100 years, N_2O has been mixed with oxygen and used in dentistry as a general anesthetic agent, an analgesic, and as a sedative With the development of more effective local anesthetics to manage pain, N_2O is used today primarily for psychosedation Its use reduces fear and anxiety in the conscious patient It is estimated that 85 to 90 percent of the patients receiving N_2O and oxygen are well sedated with 40 percent N_2O and 60 percent oxygen [1]

In 1977, T W Jones and W Greenfield estimated that approximately 35 percent of the dentists in the United States have N_2O anesthetic systems at their facility [3] It is estimated that more than 100,000 dental personnel are involved in administering N_2O to about 4 5 million patients annually in the United States [4,5]

PHYSICAL AND TOXIC PROPERTIES OF NITROUS OXIDE

PHYSICAL PROPERTIES

N_2O is an odorless, stable, noncombustible, colorless, tasteless gas that is approximately 1 5 times heavier than air The oxygen atom accounts for the oxidizing capacity of N_2O, which is a thermodynamically unstable endothermic (i e , heat absorbing) compound N_2O is manufactured commercially by thermally decomposing ammonium nitrate and purification of its byproducts [6]

SYSTEMIC EFFECTS

N_2O does not combine with hemoglobin, but is carried in the blood in a physical solution [7] It is eliminated from the body unchanged by way of the lungs, a slight amount may be excreted through the pores of the skin [8] N_2O is a weak anesthetic with rapid onset and rapid emergence,[9] and will disappear from the body in 17 to 35 minutes after anesthesia is discontinued [8] N_2O can produce several changes in cardiovascular function N_2O may depress the myocardium while stimulating the heart by central activation of the brain nuclei [10] It decreases cardiac output, stroke volume, mean arterial pressure, stroke work, and minute volume [11] Similar effects are seen in blood pressure, pulse rate, and respiration [12] In 1979, Vean and King stated that N_2O acted solely on the cerebral cortex, thus causing a mild depression and that N_2O was not allergenic [13] Amess and coworkers point out that N_2O may interfere with the function of vitamin B_{12} [14] More recently, the toxic effects have been traced to the ability of N_2O to inactivate the enzyme methionine synthetase, by oxidizing the enzyme's vitamin B_{12} cofactor Methionine synthetase allows for the synthesis of methionine and folinic acid, which are needed for deoxyribonucleic acid (DNA) synthesis [15] Researchers believe that the enzyme inactivation may explain the epidemiologic, clinical, and animal evidence that N_2O can injure various tissues of the body, including the brain, blood-forming elements, lung, kidney, and the developing fetus Supporting documentation by Sweeney et al (1985) provided direct evidence that occupational exposure to N_2O may cause depression of vitamin B_{12} activity resulting in measurable changes in bone marrow secondary to impaired synthesis of DNA [16]

REPRODUCTIVE EFFECTS

Human Studies

This agent, along with others including halogenated anesthetic compounds, has been identified in epidemiological studies as a suspected reproductive health hazard to those exposed The first published report of adverse reproductive effects of work in operating theaters was by Dr A I Vaisman, in 1967 [17] Dr Vaisman noted that 18 of 31 female anesthesiologists who had been pregnant had experienced at least one miscarriage Studies in Sweden, the United Kingdom,

and the United States generally showed adverse reproductive effects in females working in operating rooms [18,19,20] In a case-control epidemiological study of dentists, liver disease and spontaneous abortion were significantly higher among dentists (spouses of male dentists for spontaneous abortion) exposed to inhalation anesthetics more than 3 hours per week, compared with controls which used no inhalation anesthetics in their practice [21] The most comprehensive epidemiological study of health dysfunction associated with work in the operating room was conducted by NIOSH, where data were obtained from 40,044 respondents [21] Females working in the operating room demonstrated an increased incidence of spontaneous abortion and carcinoma Birth defects in their offspring were elevated, as were the offspring of nonoccupationally exposed wives of exposed male anesthetists Liver disease was also increased in both males and females In addition, spontaneous miscarriage and birth defects are confirmed in a survey of female anesthetists in the United Kingdom [21] The findings of several epidemiologic surveys were recently summarized by James T Purdham of the Occupational and Environmental Health Unit, University of Toronto, Toronto, Ontario [22] The consistent finding from these studies shows that women exposed to waste anesthetic gases have a higher than expected incidence of spontaneous abortions Congenital abnormalities in the offspring of exposed women were less strongly associated, but were slightly higher than normal [23]

Animal Studies

Supporting evidence of the toxic effect of anesthetic agents is shown in laboratory studies The evidence includes teratogenic effects in various species upon exposure to a wide group of inhalation agents at anesthetic concentrations,[31] decreased survival rate in various species, ultra-structural changes in the central nervous system of rat fetuses following a single maternal exposure, decreased ability to solve maze problems in rats, and evidence of testicular damage after a minimum of 2 days exposure to 20 percent N_2O [31]

Several animal studies have focused on anesthetic gases, principally N_2O and halothane, as a cause of miscarriage or congenital abnormalities When the animals were exposed to high levels of these anesthetics, spontaneous abortion (animal fetal resorption) and congenital abnormalities were observed In one study by Viera and coworkers, spontaneous abortion was observed in rats at 1,000 ppm or more [32] Concentrations of 1,000 ppm have been commonly found in operating rooms and dental operatories not equipped with scavenging systems

CARCINOGENICITY

Excess cancer was found in a small group of Michigan nurse anesthetists by Corbett in 1973 [24] However, another study which evaluated Corbett's work found that the high cancer rate was only for 1 year, and when all data were considered, there was no significant difference between the nurse anesthetists and the control group [25] Tests for mutagenicity (a test for screening carcinogenic agents - those which are mutagenic also tend to be carcinogenic) in bacterial systems have been shown to be negative in most test systems, except for the anesthetic fluroxene [26]

LIVER AND KIDNEY EFFECTS

A national study sponsored by the American Society of Anesthetists found that liver disease occurred more frequently among males and females exposed to anesthetic agents, however, kidney disease was less strongly associated with anesthetic exposure [23] Studies supporting these conclusions were also found in England [27] Because the workers were exposed to a mixture of anesthetic agents including halothane and methoxyflurane, it is not known what impact N_2O alone has on liver and kidney dysfunction In animal experiments, N_2O alone was shown to be without effect [22]

CENTRAL NERVOUS SYSTEM EFFECTS

Human studies testing cognitive and motor skills show that exposure to trace concentrations of anesthetic gas mixtures, N_2O/halothane or N_2O/enflurane, and N_2O by itself resulted in decreased ability to perform complex tasks [28,29] These studies suggest that exposed dentists may be working at less than peak efficiency Attempts to duplicate human performance decrements in other laboratory studies have not corroborated these earlier studies [30] While habitual use of N_2O has been linked to damage of the peripheral nervous system, it appears that further research needs to be performed to resolve the safe level of occupational exposure which does not impair performance

CONTROLS

PRINCIPLES OF CONTROL

Occupational exposures can be controlled by the application of a number of well-known principles including engineering measures, work practices, personal protection, and monitoring These principles may be applied at or near the hazard source, to the general workplace environment, or at the point of occupational exposure to individuals Controls applied at the source of the hazard, including engineering measures (material substitution, process/equipment modification, local ventilation) and work practices, are generally the preferred and most effective means of control in terms of both occupational and environmental concerns In dental operatories, exposure to N_2O may be controlled by

1) effective scavenging devices that remove excess anesthetic gas at the point of origin,

2) proper maintenance of equipment,

3) regular monitoring of environmental exposure for leaks in the anesthesia equipment delivery systems, and

4) good work practices on the part of the dentist and dental assistant

Additional controls which may be applied to anesthetic agent control include dilution, ventilation, and good housekeeping

In general, a system comprised of the above control measures is required to provide worker protection under normal operating conditions, as well as under conditions of procedure malfunction or failure Workplace monitoring devices, personal exposure monitoring, and medical monitoring are important mechanisms for providing feedback concerning the effectiveness of the controls in use The education of dental personnel and commitment of management to reduce and eliminate occupational health problems are also important elements for a complete, effective, and durable control system In dental operatories, a principal control for waste anesthetic gases is the use of nasal scavenging systems The sections which follow, briefly examine the guidelines and controls to reduce sources of N_2O exposure with and without the use of scavenging systems

American Dental Association Guidelines for Design of Scavenging Equipment

The American Dental Association (ADA) has developed guidelines for scavenging equipment [37] According to the ADA guidelines, the scavenging system equipment should have the following characteristics

- adaptable to most existing sedation, anesthesia, and exhaust systems,

- constructed so that it does not significantly interfere with normal breathing system and delivery of selected gas concentrations,

- capable of providing N_2O-O_2 levels which comply with or improve upon minimum levels indicated in current NIOSH and OSHA documents,

- effective regardless of the heating and air-conditioning system in use,

- constructed to permit safe and efficient disposal of the gases,

- effective when more than one device is being used simultaneously, and

- constructed such that patient rebreathing will be insignificant

ENGINEERING CONTROLS

Anesthesia Equipment Without Scavenging Machines

When N_2O leakage is controlled by securing valve fittings and gaskets connected to the anesthesia equipment, gas concentrations will be highest around the breathing zone of the patient, especially the nosepiece where the anesthetic is administered The administered gas concentrations escape from the patient and are diluted by mixing with room air Mixing occurs from the movement of supplied air through ducts or wall-mounted air conditioners, and from the movement of the dentist and dental assistant N_2O concentrations will vary according to the amount of fresh air supplied to the dental room and the room configuration (i e , open or closed architecture) [5] Personal exposure to the anesthetic will vary according to the proximity of the dentist and dental assistant to the breathing zone of the patient Previous survey observations have shown that the dentist usually works within 6 to 12 inches above the patient's breathing zone, while the dental assistant works within 12 to 24 inches of this zone In a still environment, little dilution of N_2O takes place between the working level of the dental personnel and the patient The concentration of N_2O may increase or decrease in the room, dependent upon the general room air ventilation This becomes particularly evident when performing gas analysis with a direct-reading instrument over the course of the dental surgery If the room is not well ventilated, gas concentrations may not return to base line levels, and background concentrations may increase as other operations using N_2O are performed Personal exposures of N_2O found in earlier surveys conducted by NIOSH researchers varied from 25 ppm to 2,400 ppm [38]

Anesthesia Equipment With Scavenging Machines

After the 1977 NIOSH document on controlling waste anesthetic gases in dental operatories was published and recommended the use of scavenging systems,[5] several other publications have presented various systems for controlling

these gases [39,40,41] Anesthetic scavenging systems are broken into three components a scavenging or collection device to contain the anesthetic gas in a breathing circuit and ventilator, a disposal system to carry the collected gases from the operating room (i e , a vacuum system), and a device for ensuring that negative or positive pressures in the system do not adversely affect the patient The most common scavenging system design includes a scavenging circuit (Mapelson D), a nasal mask, and a vacuum system The most common nasal mask for scavenged systems has two concentric masks in which anesthetic gases are supplied through a pair of tubes to the center of the mask A second set of tubes are also attached to the outer space of the mask to provide exhaust at a recommended flow rate of 45 liters per minute [5] This configuration allows for scavenging of excess gas supplied to the patient, as well as excess gas which may escape around the edges of the mask

While such scavenging systems have been shown to significantly reduce anesthetic gas exposure, field studies conducted by NIOSH researchers have shown that, under normal operating conditions, such systems do not consistently reduce N_2O to the recommended exposure limit (REL) of 25 ppm during the period of anesthetic administration [42-48]

A study to determine the efficiency of different scavenging devices by means of a standardized experimental model was conducted by Hallonsten in 1982 Eight different masks were tested under well-controlled sedation techniques Efforts were made to reduce N_2O leakage by employing leak-proof equipment and carefully positioning the nose mask The median dentist breathing zone N_2O concentrations varied from 4 to 385 ppm and the ambient air concentrations (i e , in the dental facility, but not in the dentist's breathing zone) ranged from 0 to 55 ppm [48] These results appear consistent with the NIOSH studies mentioned above for operatories using scavenging systems which showed a range from 0 ppm to 1,300 ppm [42-48]

Ventilation

Fresh air conditioning also may reduce the concentrations of N_2O in the dental suite The recirculating type of air-conditioning system is the one most often employed In a recirculating system, a percentage of air is mixed with fresh air and recirculated back into the room Therefore, increasing the amount of fresh air decreases the recirculated N_2O Recirculating systems, which are temperature controlled for fresh air mixing, may supply 100 percent fresh air depending upon the temperature outside In many buildings with recirculating systems, the most cost-effective temperature setting is 55° When the outside air is above or below the 55°F temperature, inside air is mixed with the outside air in varying percentages

In addition to recirculating air-conditioning systems, there are "one-pass" nonrecirculating systems which exhaust all dental air outside the building Unfortunately, such systems are expensive to operate because of the amount of air conditioning required for comfortable room temperatures Wall-mounted air-conditioning units are another alternative to bringing fresh air into the work environment The drawback of the wall-mounted units is that the dampers are usually manually controlled for bringing in outside air In some units, the dampers are not easily accessible and, therefore, not adjusted for the

changing seasons In many buildings where energy efficiency is required, the dampers of these units are locked closed by maintenance personnel, so that only room air is recirculated

METHODS

SCAVENGING SYSTEM AND SITE SELECTION

Based on the information from the American Dental Association (ADA) regarding scavenging devices for control of waste anesthetics in dental operatories and telephone contact with the manufacturers listed by the ADA, four scavenging systems were recommended for evaluation Fraser-Harlake, Porter-Brown, Blue, and the Comfort Cushion A fifth scavenging system, the MDT McKessen, was added for evaluation because it had design features such as a clear nasal dome to assist the dentist in monitoring patient nose breathing, which helped control N_2O The Porter-Brown and MDT McKessen N_2O Scavenging Systems are the second and third scavenging systems to be evaluated

The University of California at San Francisco (UCSF) School of Dentistry, Department of Oral Surgery, was selected for evaluation of its nitrous oxide scavenging systems because it met with the project protocol for the scavenging systems to be evaluated, i e , the Porter-Brown scavenging system and MDT McKessen, a minimum of four dentists (in this case, oral surgeons), a minimum of four dental (oral) surgeries, performance of operations in separate operating rooms, the appearance of good work practices, and sound management of scavenging system use The first goal of this project is to examine the effectiveness of scavenging systems to reduce N_2O to the NIOSH REL To help achieve this goal, an in-depth survey was conducted at the UCSF School of Dentistry, Department of Oral Surgery, in San Francisco, California, on July 25-28, 1988 At the time of this survey, this facility had approximately 6 oral surgeons, 8 surgical assistants, and 12 support staff The facility performs dental work on an average of 15 patients per day, with approximately 50 percent of those receiving N_2O during dental surgery This facility has ten dental chairs, all equipped with anesthetic gas delivery and scavenging systems The surgical suites have floor to ceiling walls with single door entrances The UCSF Oral Surgical Clinic has used the Porter-Brown scavenging system for more than 10 years

CONDUCT OF SURVEYS

The in-depth site visit was conducted according to the Regulations for Investigations of Places of Employment, Code of Federal Regulations (CFR), Title 42, Part 85a The project officer contacted the dental facility in advance of the planned visit and provided details about the goals and objectives of this project

During this in-depth survey, ten dental operations were monitored Infrared thermography was used to "visualize" N_2O during surgery during seven of the ten surgeries The following sections report the aspects of monitoring the dental environment to determine anesthetic gas leak sources during surgery

Real-Time Sampling

During each dental operation, N_2O was measured and recorded continuously The Miran 1A infrared gas analyzer (Foxboro Instruments, Inc , Foxboro, Massachusetts) was used to measure the anesthetic gas concentration levels The variable filter, variable path length infrared analyzer with 20 25 meter cell, was adjusted for N_2O The Miran 1A has direct-reading scales with a response time constant of approximately 15 seconds under continuous operation The lag time is caused by a combination of factors including transport of the gas to the analyzing chamber, mixing of gas in the chamber, and instrument response Because of the time lag of 15 seconds or more, the peak and low exposures were averaged and do not report the instantaneous N_2O concentrations at the time of exposure However, the performance of this instrument for real-time sampling greatly outweighs this limitation in exposure averaging The Miran 1A sampling port was located approximately 7 to 15 inches above and 6 to 8 inches behind the patient's mouth (the average distance of the oral surgeon and surgical assistant's breathing zones for each of the dental operations monitored) The following instrument settings were used wavelength of 4 48 micrometers, slit width of 0 50 millimeters, and a path length of 6 75 meters The Analytical Limit of Detection under laboratory conditions is 0 07 ppm, under field conditions in this study the Analytical Limit of Detection was 1 ppm The Miran 1A has a detection range of approximately 1 to 1,000 parts of N_2O per million parts of contaminated air by volume (ppm) The Miran 1A was calibrated before and after each survey A lecture bottle of electronics-grade N_2O calibration gas was used to calibrate the Miran 1A for the detection range mentioned above Real-time gas concentrations registered by the Miran 1A were recorded by a Rustrak Ranger™ 4 channel data logger Information collected by the data logger was uploaded into a portable Compaq™ computer The N_2O data collected from each of the dental operations was organized by using Pronto™ and Lotus 123™ computer software Nitrous oxide data was collected at 1-second intervals and concentrations were averaged at 15-second intervals

Motion and time measurement techniques were used to document activities of the oral surgeon, the surgical assistant, and the patient during the operation [50] Portable videotape recorders and camera ensembles (Panasonic Video Recorder/Player Model #2, NV 8400 Camera, and Panasonic Video Camera, Model #3245) were used during the entire operation The internal clock of the camera was synchronized with the computer, so that changes in N_2O concentration could be correlated with dental surgical activities Selected dental surgical activities were identified from the videotapes These activities were coded and inserted on a computer spreadsheet, along with the N_2O concentration data Statistical analysis of the N_2O concentration and changes in concentration were modeled as a function of these work elements from the spreadsheet The real-time N_2O data and surgical practices which may have caused changes in N_2O levels are shown in Appendices A and B

There were ten dental operations in which real-time sampling of N_2O was sampled All of these operations were correlated with personal breathing zone samples from the oral surgeon and surgical assistant With the exception of Operation #8, all operations were performed using the Porter-Brown Scavenging Mask Operation #8 was performed using the MDT McKessen Scavenging Mask

Eight of ten operations were performed in Room D1218, Operations #9 and #10 were performed in Room D1222 Seven of eight operations performed in Room D1218 were videotaped with the use of an infrared scanner (Thermovision™ 782 System) in order to visualize the N_2O escaping from the patient's breathing zone during surgery (Operation #7 was not recorded with the infrared scanner because of the depletion of liquid nitrogen to run the camera) The infrared scanner was used to determine N_2O leak profiles from the patient during surgery This information is especially important in determining strategies for N_2O control around the mask and from the patient's mouth

Personal and Area Sampling

Personal breathing zone samples were taken for the oral surgeon and surgical assistant for all ten operations (Table 2) During each of the operations, general area samples were taken at the room air supply and exhaust vents and areas outside the room (Table 8)

Personal and general area air exposures to N_2O were collected in 30-liter bags and analyzed at this facility using a calibrated Miran 1A infrared gas analyzer Battery-powered universal flow sampling pumps (SKC 224-PCXR7, SKC Incorporated, 334 Valley View Road, Eighty Four, Pennsylvania) modified for bag filling were used to draw air through a section of tygon tubing (¼-inch diameter) into a Tedlar™ bag The sampling pumps were calibrated at a flow rate of 1 5 liters per minute (l/min) for both personal breathing zone samples and for general area samples In order to follow the NIOSH collection techniques for evaluating N_2O during the time of administration, the sampling pumps were turned on when the N_2O was turned on, and turned off when the N_2O was turned off General area sampling was conducted at the door entry to the operatory, in the main hallway of the facility, at the room air supply and the room exhaust fixtures, and at the appointment desk (separate from the operatories) The floor plan and general sampling areas for N_2O at UCSF oral surgical clinic are shown in Figure 1 Personal and Real-Time N_2O Sampling Locations, Surgical Suite Layout, and Visual and Infrared Videography Setup are shown in Figure 2

Observation of Work Practices

Work practices of the dentists and dental assistants were evaluated to discern potential anesthetic gas exposure during surgery Dentists and dental assistants were videotaped during surgery Work analysis was conducted by running the videotapes at normal speed and "stop action" to determine work elements which may increase or decrease anesthetic gas exposure Motion and time measurement techniques were used to catalog the work elements Work elements, which may influence changes in N_2O concentrations, were selected for detailed analysis (see section entitled "Real-Time Sampling") These work elements are detailed in Table 1

The real-time N_2O data were later synchronized with the videotapes to confirm observation of exposure sources, and to compare N_2O levels during the surgical operation The data acquisition system, used to integrate data from environmental sampling with work practices, is shown in the data acquisition system schematic in Figure 3

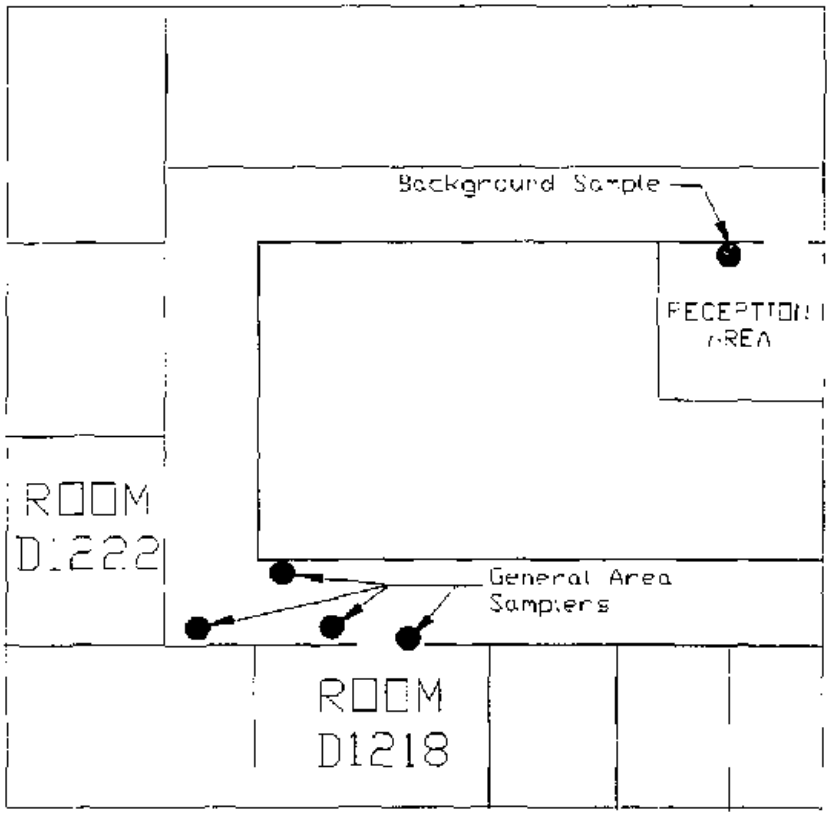

Figure 1 Floor Plan and N_2O General Area Sampling Locations

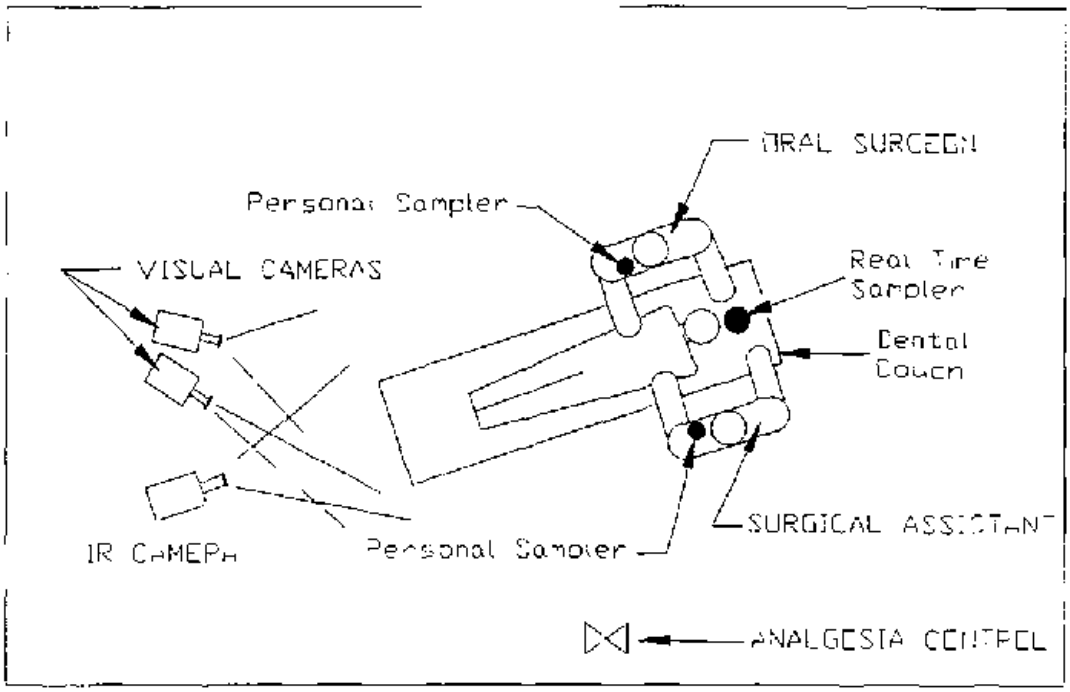

Figure 2 Personal and Real-Time N_2O Sampling Locations, Surgical Suite Layout, and Visual and Infrared Videography Setup

Table 1 Definitions, Codes, and Abbreviations for Work Practices, Procedures, and Tables Reporting N_2O Results

Definitions	Codes
Time of dental operation organized into 15 second intervals and listed as 4 intervals per minute (i e , 25, 5, 75, 1 0, etc)	(TIME MIN)
Concentration of N_2O in ppm	(CONC PPM)
Percent N_2O Delivered from the Anesthesia Machine to the Patient	(N_2O %)
Dentist using dental tool to loosen epithelial attachment around tooth and tooth elevation for removal	(PULL/POKE)
Sampling probe distance from patient's nose during oral surgery	(PROBE DIST)
Needle injection to numb patient's tooth before oral surgery	(INJECTION)
Aspirator used to suction patient's mouth cavity during oral surgery	(ASPIRATOR)
Water used to rinse patient's mouth during oral surgery	(WATER)
Patient talking during oral surgery	(PATIENT TALKING)
Dentist drilling patient's tooth	(DRILL)
Other activities which could not be easily catalogued but which may have an impact on changing N20 concentrations	(OTHER)
Type of mask With the exception of data set #9, all scavenging masks were Porter-Brown (coded as 1) Data set #8 was the MDT McKessen (coded as 2)	(MASK TYPE)
The dental team which performed surgery on the patient there are 4 teams	(DENT TEAM)
The type of dental operation There are 5 operations which range from having 4 wisdom teeth removed (1) to tooth implantation (5)	(OTHER)
Table Abbreviations	
TABLE 2	Codes

The dental operation in which N20 was gathered	OPER #
The room number and scavenging mask type	ROOM #/MASK
Patient gender, age, and type of oral surgery	PATIENT/NOTES
Surgical Team from 1 to 4	SURGICAL TEAM
The time-weighted average personal concentration of N20 for the oral surgeon	N20 TWA SURGEON
The time-weighted average personal concentration of N20 for the assistant oral surgeon	N20 TWA ASSIST
The time-weighted average real-time concentration of N20 as detected above the patient's head	N20
The N20 concentration range used by the oral surgeon during dental surgery	N20% RANGE
The time in minutes N20 was administered to each patient during oral surgery	TIME (MIN) N20 ADMIN
The time in minutes N20 was detected by the real-time sampling instrument located above the patient's head - includes time after the N20 was turned off	TIME (MIN) N20 DETECTED
The time N20 was detected by the real-time sampling instrument located above the patient's head which was greater than 25 ppm - includes time after the N20 was turned off	TIME (MIN) N20 > 25 PPM
The length of time, in minutes, of the dental operation for each patient	LENGTH OF OPERATION/TIME (MIN) SAMPLING
TABLE 3	Codes
The operation performed by the dental surgeon For example OPER_# UCSF1 = Operation #1)	UCSF1, UCSF2, etc ,
The oral surgical team (1 of 4 teams)	TEAM #
The type of operation performed by the oral surgeons during oral surgery on the patient	MCANE (Mandibular Canine), WISD4 (Removed 4 Wisdom Teeth), WISD2 (Removed 2 Wisdom Teeth), IMPLA (Tooth Implantation), TUBRE (Bicuspid/Tuberosity)

Time, in minutes, of oral surgery	TIME_OP (min)
Time, in minutes, the N20 was turned on	N20_ON
The percent of time the N20 was turned on during oral surgery (TIME_OP/N20_ON = %TIME_ON)	%TIME_ON
Time, in minutes, the N20 was turned off to the completion of oral surgery on the patient	N20_OFF
The average concentration of N20 from the beginning to the end of the of oral surgery	AVGALL(ppm)
The average concentration of N20 from the time this gas could be detected	AVGDET(ppm)
The average concentration of N20 during the time this gas was turned on to the time it was turned off	AVGON(ppm)
The average concentration of N20 during the time the gas was turned off to the end of the oral surgery	AVGOFF(ppm)
The maximum concentration of N20 detected	MAX
The standard deviation of N20 detected	S D

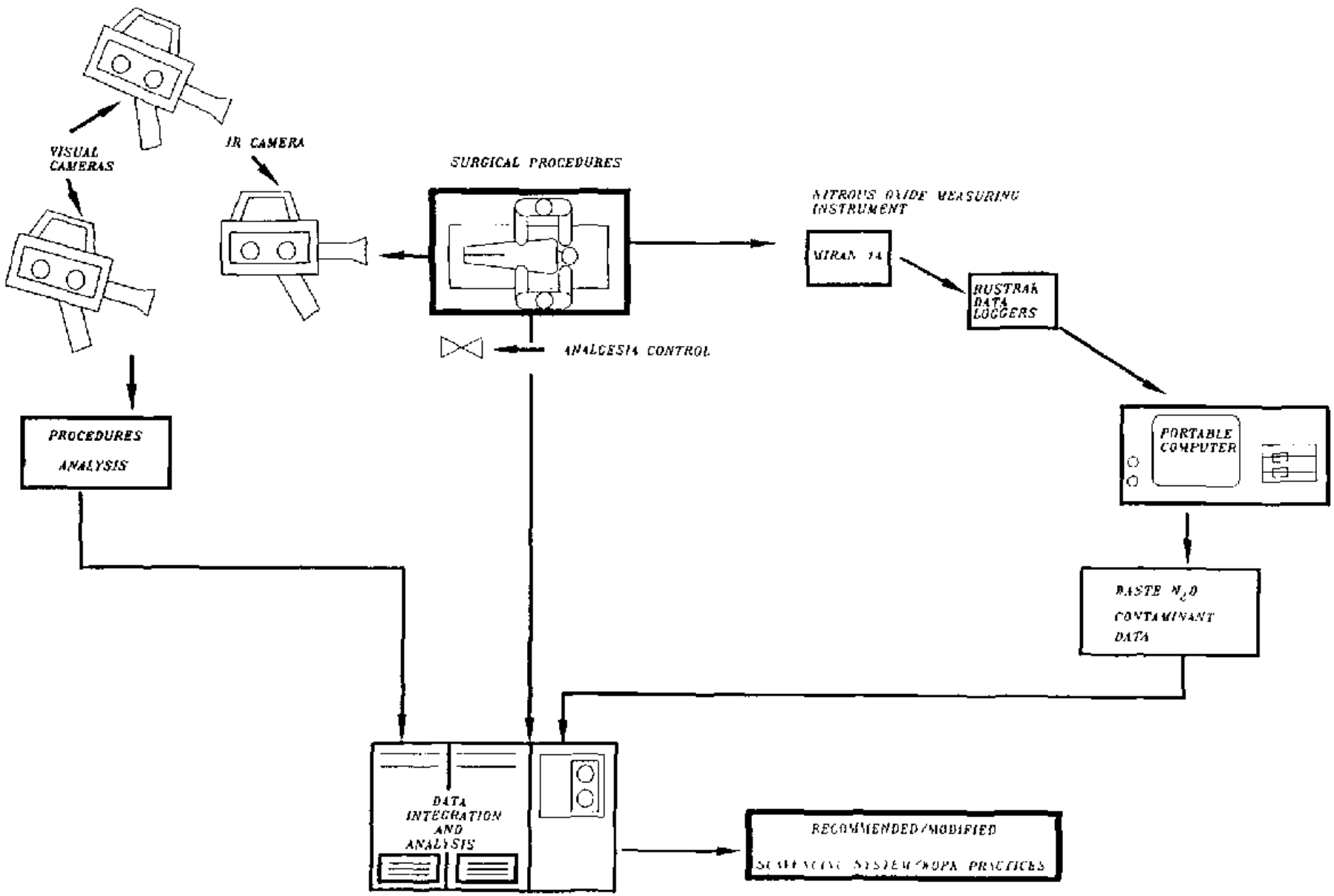

Figure 3. Data Acquisition System for Evaluating N_2O Exposure in Dental Offices

Observations of Work Practices and Changes in N_2O Exposure

Videotape analysis of the surgical procedures was conducted to detail the surgical practices and other factors which may have affected N_2O levels In addition, visualization of the N_2O detected from the patient's mask and Evaluation of General Ventilation Systems breathing was videotaped using an infrared camera Preliminary screening of the videotapes showed that several surgical procedures may influence the concentration of N_2O during dental surgery These surgical elements included the regulation of the anesthetic gas delivery machine, the initial concentration of the N_2O delivered, changes in concentration over the course of the operation, the use of oral surgical tools as a function of loosening the gum lining from the patient's teeth, the real-time sampling probe distance from the patient's nose during surgery, needle injection, aspirator and water syringe, patient talking, drilling, other activities, type of mask, oral surgery team, and type of oral surgery Based on the results from analysis of the surgical procedures, additional observations of the videotapes from the infrared camera were performed to understand N_2O exposure patterns Examples of when the infrared videotapes were used included patient mouth breathing, N_2O leakage from poor nasal cone fit, and the direction of N_2O caused by air currents

General ventilation measurements were taken for two oral surgical operatories D1218 and D1222 For these areas, the Kurz Model No 480, TSI Model No 1650, and Alnor (Balometer) were used to measure air velocity and average flow rate, respectively Room air exchange rates were evaluated by determining dental operatory size with the amount of fresh air coming into the room Smoke tubes were used to assist in observation of general airflow patterns Building blueprints were used for locating air duct locations and comparing flow rates with building design specifications

Leak Testing Scavenging Equipment

All N_2O delivery equipment was visually inspected to determine that all components were in place and to make sure there were no obvious tears, cracks, abrasions, or worn spots If there was an obvious problem with the general repair or maintenance of the equipment, then the equipment was replaced before quantitative leak testing was conducted The layout of the anesthetic gas delivery and scavenging system with a detail of the Porter-Brown Scavenging Mask is shown in Figure 4

Leak testing of low-pressure components of the anesthesia scavenging machine was determined by using the Miran 1A The gas delivery system was turned on and the end of the hose where the scavenger mask is connected was blocked with the thumb A tygon tube connected to the Miran 1A was used as a "sniffer" to detect N_2O leaks from the wall connection to the mask connection For high-pressure leaks, soap solution and a swab applicator were applied around the valve connections of N_2O supply cylinders to check for leaks in the form of soap bubbles The supply cylinders of N_2O and oxygen were located in another section of the building where the gases were supplied to the operatories through gas line connections

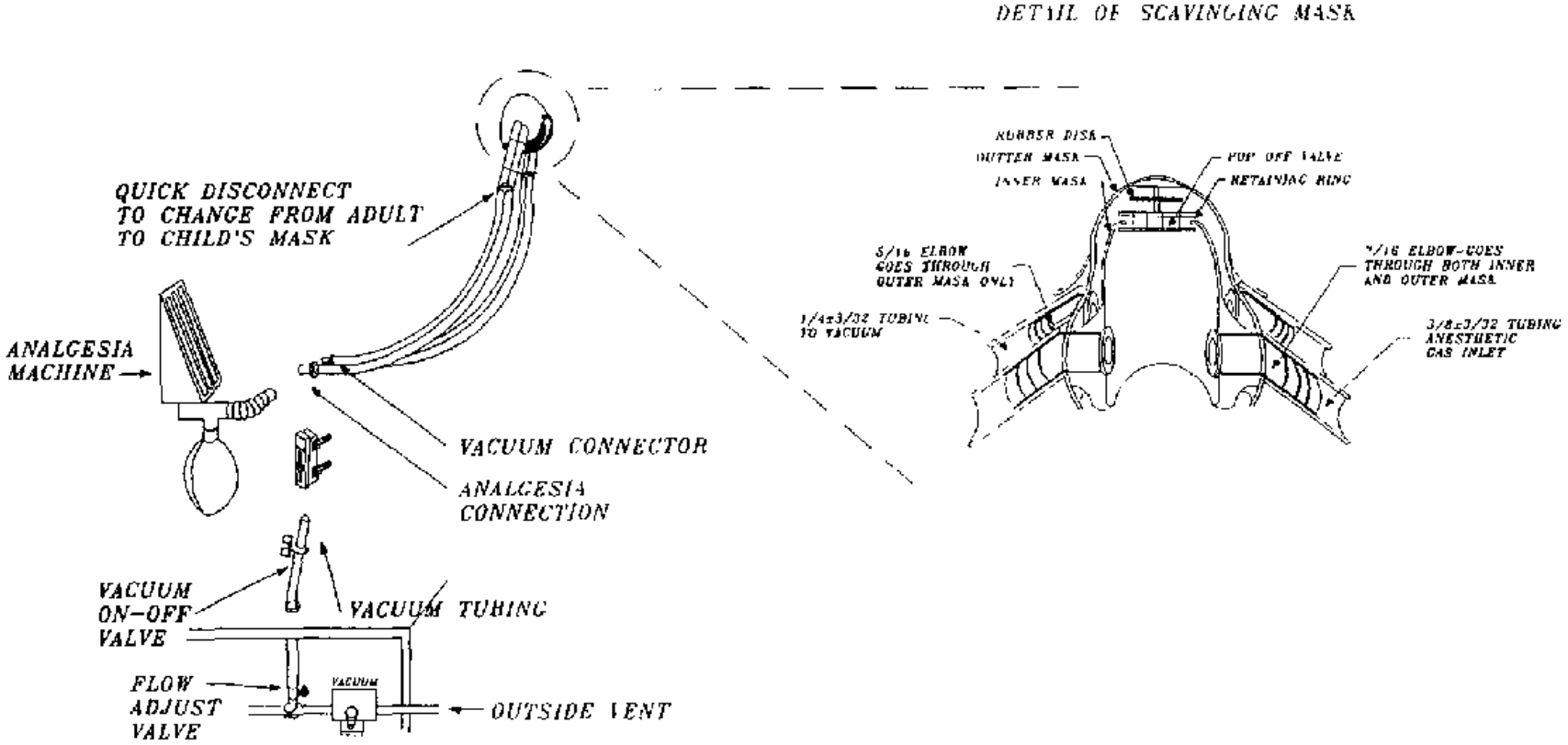

Figure 4. Layout of the Anesthetic Gas Delivery and Scavenging System with a Detail of the Porter-Brown Scavenging Mask.

During the surveys, NIOSH researchers noted selection of scavenging masks for proper anthropometric fit Mask selection may help reduce N_2O, if a good fit is made between the patient's nose and the mask size The Porter-Brown masks come in small, medium, and large sizes The small masks (or pedo masks) are designed for children, the medium and large masks for adolescents and adults, respectively If a large mask is used on a child, then there is a possibility that excess N_2O may escape into the oral surgeon's and surgical assistant's breathing zone During the NIOSH survey, only adults were scheduled for dental surgery and only the large adult size was used It was noted that there was more potential for N_2O to leak from the top of the mask near the patient's nose and eyes if the patient's nose profile was low

DATA ANALYSIS

Paired student t-tests were used to compare differences in N_2O concentrations between the personal breathing zone results of the oral surgeons and surgical assistants Paired student t-tests also were performed for the real-time probe results and compared to the personal breathing zone results of the oral surgeons and the surgical assistants [51]

Analysis of variance (ANOVA) was used to compare N_2O real-time sampling results for the two operatories Room D1218 and Room D1222 [51]

Mallows C_p statistic (which measures the sum of squared biases plus the squared random errors in Y at all N data points) was used to select the model relating work activity to changes in N_2O concentration for the dental operations mentioned above[52] Separate models were tested for each dental operation The Statistical Analysis System (SAS) Procedure, PROC REG, was used for this regression analysis [52] Note that because of the limited sample size, statistical significance may not be demonstrated for all variables encountered during this in-depth field study

General area sampling was performed to determine if N_2O was present outside of the dental operatories such as in the hallway, and appointment desk General area sampling was also conducted to determine if N_2O was being recirculated in the building's ventilation system Because no gas cylinder leaks were found during the surveys and the N_2O levels were low relative to the dental operatories, no statistical tests appeared necessary for the general area samples Because of the low general area concentrations, statistical comparisons were not performed between these levels and personal sampling results

STATISTICAL ANALYSIS METHODS

In-Depth Statistical Analysis of Real-Time N_2O Data

Ten data sets, representing operations on ten patients by four dental teams, were analyzed in two ways (1) to determine what effect dental practices and other factors such as probe distance and changes in N_2O delivery concentration had on N_2O concentration measured, and (2) to determine if differences among dental teams or among type of dental operation affected ambient levels of nitrous oxide

Analysis of Factors Affecting Nitrous Oxide Levels

The dependent variable was the concentration of nitrous oxide during a time interval, transformed by using the logarithm to better achieve homogeneity of variances Nine factors (i e , dental practices and other) were examined Each could be present or not present in a given time interval of 15 seconds The immediate effect of the presence of each of the factors, as well as the delayed effects for a lag of one (15 seconds), two (30 seconds), and three (45 seconds) time intervals, were studied through multiple regression An optimal model was selected by choosing the model which minimized Mallow's C(p) statistic, where (p) is the number of variables in the regression equation [52]

Limitations in Data Analysis

For each of the ten dental surgeries analyzed, there were more than 150 possible models to compare In all cases, the "best" of these differed from the next 20 to 30 models only slightly on the Mallows C_p statistic, the multiple correlation, the adjusted multiple correlation, and the criteria The selected model is at best only suggestive of important relationships Limitations in the selected model for N_2O exposure sources are shown below

1 In some cases, nitrous oxide from previous operations appeared to remain in the N_2O delivery system (even after operations where oxygen flushing was performed), most of the N_2O being in the rebreathing bag When the next operation begins, this residual N_2O is breathed in and exhaled by the patient, thus making it harder to analyze the data for work practice effects

2 There was some confounding among the variables The confounding of variables blurs the effects and produces numerical problems for least squares statistical analysis Little could be done about confounding, except to delete sets of independent variables found to correlate highly with other sets There may be interactions among the independent variables, but there were too many independent variables to permit analysis of such effects

3 The effects of the sequence of occurrence of factors on their effects were ignored, except in one case, Operation #4 This operation illustrates the possible magnitude of sequence effects It was noticed that nitrous oxide concentration levels continued to rise and then fall after the delivery of N_2O was turned off Therefore, the data for Operation #4 was divided into two segments - when the nitrous oxide source was on and when it was off, respectively - and each segment was reanalyzed Results for the two analyses are similar to each other, but quite different from those for the entire series of data not divided Thus, the presence or absence of mouth breathing, apparently affected the manner that other factors affected nitrous oxide concentration Of course, sample size differences and differences in dental behavior before and after the patient was fully sedated may have also affected results

Analysis of Team and Operation Differences

If dental practices affect the level of escaped nitrous oxide, then one might expect to find differences associated with the four dental teams that were studied The type of dental operation might also appear to be a factor as well Five different dental operations were studied While two masks were used, one of the masks was used for nine patients, so that a comparison between the masks would be difficult Analysis of team and operation differences included the following

1 It was decided to use the mean level (on a log scale) of nitrous oxide concentration for the series as the dependent variable This was done because the factors of "dental team" and "type of dental operation" were "between" subject factors and the measurements of N_2O for a series were on the same subject Some limitations of using the logarithm mean level of N_2O were apparent from the following observations In some cases, positive concentrations of nitrous oxide were observed even before the source was turned on, apparently because residual N_2O had been trapped in the anesthesia delivery system from a previous operation In some of the data sets, positive nitrous oxide concentrations occurred before and immediately at the point that the source was turned on In other cases, there was lag of one or more time intervals before positive concentrations were observed after the source was turned on Thus, the mean levels may reflect factors besides dental practice or the type of dental operation

2 The distribution of dental operations among the four dental teams is not conducive to the study of which of these two factors affect the mean nitrous oxide concentration What is required in order to find significance is that several teams perform the same operations and that each of the operations be performed by several teams This did not occur and the effects of team, operation, and team by operation may be confounded

3 Only one team performed the same operation more than once This provides only one case of replication to study between patient replication It is not possible to obtain an appropriate error term with only one replication, unless one assumes that between patient error variances do not depend on either the dental team or the operation performed Another obstacle is that patients were not randomly assigned to dental teams and operations

RESULTS

There were ten dental operations in which personal and general area air sampling was conducted for N_2O exposure The information which follows shows the N_2O results from all of the sampling runs conducted Detailed analysis of these data are included for dental operations in which personal, general area, and real-time monitoring took place

Of the ten oral surgeries, nine of these surgeries were performed with the use of the Porter-Brown Scavenging System One was performed using the MDT McKessen (Operation #8) The first eight operations were performed in Dental Operatory D1218, Operations #9 and #10 were performed in Dental Operatory D1222

The duration of oral surgery for the ten operations ranged from 32 minutes to 100 minutes The percentage of time N_2O was on during surgery ranged from 18 to 89 percent The percentage of N_2O administered to the patients ranged from 20 to 50 percent Four of the operations involved changes in N_2O concentration to the patient by the oral surgeon during surgery (20 to 40 percent, N=2, and 33 to 50 percent, N=2) The remaining operations did not involve changes in N_2O concentration to the patient (33 percent, N=4, 50 percent, N=2) The N_2O supplied to the patient ranged from 2 to 3 lpm, while oxygen was supplied at 3 to 4 lpm The total anesthetic mixture airflow administered to the patient for all operations was between 5 to 6 lpm The types of oral surgery included (1) the removal of wisdom teeth, four extracted, N=6, (2) two extracted, N=1, (3) tooth implant, N=1, (4) remove mandibular canine, N=1, and (5) bicuspid removal, N=1 There were eight female patients and two male patients ranging in age from 20 to 74 years

PERSONAL BREATHING ZONE SAMPLING

Waste N_2O concentrations for the ten operations ranged from less than the detection limit (i e , <1) (Operation #7) to 277 ppm (Operation #2) during the time of administration for the oral surgeons, and from less than the detection limit (Operation #7) to 77 ppm (Operation #6) for the oral assistants (Table 2) Waste N_2O concentrations for two of the oral surgeon's operations (#4 and #5), and for three of the surgical assistants operations (#4, #5, and #8), could not be determined because the personal sampling time was less than 2 minutes The average N_2O concentration for the oral surgeons for the operations that could be measured was 89 ($\pm$114), and for the surgical assistants it was 26 ($\pm$31) ppm Team concentrations averaged from 4 ($\pm$5) ppm for team #3 to 257 ($\pm$29) ppm for team #1 for the oral surgeons, from less than 1 ppm for team #3 to 77 ppm for team #4 for the surgical assistants Generally, the oral surgeons had higher personal concentrations (89 ppm $\pm$114 ppm) than the surgical assistants (26 $\pm$31 ppm) Two exceptions were Operation #9 and Operation #3, where the surgical assistants had slightly

Table 2 A Summary of N_2O Results for Personal and Real-Time Sampling, the Amount of N_2O Administered, Time the N_2O was Administered, and Length of Operation

Data from U of C San Francisco Oral Surgical Clinic – Waste Nitrous Oxide Data by Operation

OPER #	ROOM #/ MASK	PATIENT/NOTES	SURGICAL TEAM	N20 TWA Surgeon	N20 TWA ASSIST	N20 REAL-TIME	N20% RANGE	TIME (MIN) N20 ADMIN	TIME (MIN) N20 DETECTED	TIME (MIN) N20>25ppm	LENGTH OF OPERATION/ TIME (MIN) SAMPLING
1	D1218 P-BROWN	FEMALE 70yrs MANDUBULAR CANINE	# 1	236	20	1 1 0	N20(20-40)	18 50	28 50	18 75	32 50
2	D1218 P-BROWN	MALE 24yrs REMOVED 4 WISDOM	# 1	277	16	1 3 5	N20(20-40)	31 00	39 25	31 25	39 25
3	D1218 P-BROWN	FEMALE 24yrs REMOVED 4 WISDOM	# 2	1	5	1 7 0	N20(33-50)	36 75	52 25	49 25	52 25
4	D1218 P-BROWN	FEMALE 38yrs REMOVED 4 WISDOM	# 3	*	*	1 1	N20(33)	15 25	55 00	43 75	62 50
5	D1218 P-BROWN	MALE 26yrs REMOVED 2 WISDOM	# 3	*	*	1 1 8	N20(33)	21 00	32 25	24 75	44 00
6	D1218 P-BROWN	FEMALE,22yrs REMOVED 4 WISDOM	# 4	138	77	1 7 3	N20(50)	27 75	33 00	28 5	45 75
7	D1218 P-BROWN	FEMALE 75yrs TOOTH IMPLANT	# 3	<1	<1	1 7	N20(33)	17 75	93 00	19	100 25
8	D1218 MDT-MCK	FEMALE 49yrs REMOVE BICUSBID	# 3	7	*	6 7	N20(33)	17 75	44 50	28 25	62 25
9	D1222 P-BROWN	FEMALE 20yrs REMOVED 4 WISDOM	# 2	45	64	3 0	N20(33-50)	45 50	48 20	40 4	51 50
10	D1222 P-BROWN	FEMALE 24yrs REMOVED 4 WISDOM	# 2	6	3	3 7	N20(50)	27 50	38 50	33 5	38 50

* = Sampling time < 2 minutes for Nitrous Oxide

higher concentrations of 19 ppm and 4 ppm, respectively The greatest difference in N_2O concentrations between the oral surgeons and surgical assistants was found in team #1, where concentrations were approximately an order of magnitude higher (236 versus 20 ppm) The lowest concentrations was found among team #3, where the only personal sample concentration was 7 ppm for the oral surgeon, and less than 1 for the surgical assistant (Operation #8) Personal sampling N_2O concentration did not appear to be related to the type of operation performed (i e , extraction of 4 wisdom teeth, 2 wisdom teeth, mandibular canine, bicuspid/tuberosity, and tooth implant) The range of N_2O for the extraction of 4 wisdom teeth was 1 ppm (Operation #3) to 277 ppm (Operation #2), for the oral surgeons Other types of operations included bicuspid removal (7 ppm), tooth implant (<1 ppm), and removal of the mandibular canine (236 ppm) The average N_2O concentrations for the oral surgeons was 110 ($\pm$126) ppm for Room D1218, and 26 ($\pm$28) ppm for Room D1222, for the surgical assistants it was 24 ($\pm$31) ppm and 34 ($\pm$43) ppm, respectively

COMPARISON BETWEEN SURGICAL TEAMS AND TYPE OF OPERATION

There were four surgical teams and five types of operations during the NIOSH survey Statistical analysis showed that of the differences (four teams and five operations) examined, only one was significant (team #3, Operation #5 at 118 ppm versus team #3, Operation #7 at 17 ppm, $p< 05$) Unless there was a priori reason to expect that particular difference to be large, this difference is not strong evidence in support of the notion that either oral surgical team or type of operation performed has a large effect on the mean level of nitrous oxide concentration

REAL-TIME SAMPLING

Mean N_2O concentrations for the ten operations ranged from 11 ppm (Operation #4) to 173 ppm (Operation #6) during the time of administration, the mean was 89 ($\pm$62 ppm) The peak N_2O concentration of over 1,000 ppm was detected in two of ten operations (Operations #3 and #6) When the values were averaged over the duration of the surgical operation (i e , from when the operation started to when it ended), the values were slightly less 6 to 110 ppm N_2O levels decreased after the gas was turned off and averaged 2 ppm to 68 ppm from the time the gas was turned off until surgery was completed

COMPARISON BETWEEN PERSONAL VERSUS REAL-TIME SAMPLING

Generally, real-time sampling N_2O concentrations (94 ppm) were more closely correlated with the oral surgeon's personal sampling results (89 ppm) than the surgical assistant's results (26 ppm) However, the range of exposure for the personal sampling results was greater (<1 to 277 ppm) compared to the real-time results (11 to 173 ppm)

COMPARISON BETWEEN ORAL SURGEON AND SURGICAL ASSISTANT

Comparisons between the oral surgeon and the surgical assistant for seven paired samples for Operations #1, #2, #3, #6, #7, #9, and #10 showed the mean for the oral surgeon was 100 ($\pm$118), and 26 ($\pm$31) ppm for the surgical

assistant The median was 45 for the oral surgeon and 16 for the surgical assistant The paired two-tailed t-test with 6 degrees of freedom did not show significant differences between the two means (p= 142) While the oral surgeon tended to be higher in N_2O concentration compared to the surgical assistant, there was a large variation between operations for the surgeon (<1 to 277 ppm), and the variation for the surgical assistant was much lower with the N_2O ranging from <1 to 77 ppm

COMPARISON BETWEEN ORAL SURGEON AND REAL-TIME

The oral surgeon and real-time N_2O concentrations for eight paired samples for Operations #1, #2, #3, #6, #7, #9, and #10 were 89 (±114) and 94 (±62) ppm for real-time, respectively The medians were 26 ppm for the oral surgeon and 98 ppm for the real-time measurements The paired two-tailed t-test with 7 degrees of freedom did not show significant differences between the two means (p= 870) The oral surgeon showed more variability between operations with a range of <1 to 277 ppm, compared to the real-time range from 17 to 170 ppm

COMPARISON BETWEEN SURGICAL ASSISTANT AND REAL-TIME

The surgical assistant and real-time N_2O concentrations for seven paired samples for Operations #1, #2, #3, #6, #7, #9, and #10 were 26 (±31) and 96 (±110), respectively The median for the surgical assistant was 31 ppm and 67 ppm for the real-time measurements The paired two-tailed t-test with 7 degrees of freedom showed significant differences (p= 034) between the mean concentrations for the surgical assistant and the real-time sampling results The surgical assistant showed less variability between operations with a range from <1 to 77 ppm, compared to the real-time range of 17 to 173 ppm

OBSERVATIONS BETWEEN PERSONAL VERSUS REAL-TIME

Overall, the oral surgeon samples were similar in concentration to the real-time results (<7 percent difference) However, the range of values between the oral surgeons was much greater (<1 to 277) compared to the real-time samples (17 to 173) This difference may be related to the closer proximity of the oral surgeon's breathing zone to the patient's breathing zone compared to the real-time sampling probe placement One oral surgeon showed higher N_2O values (Operations #1 and #2) compared to the other surgeons, and an order of magnitude higher when this surgeon's concentrations are compared to his surgical assistant (256 ±29 versus 18 ±3 ppm) A summary of N_2O results for personal and real-time sampling, the amount of N_2O administered, time the N_2O was administered, and length of operation is shown in Table 2 Table 3 shows real-time N_2O concentrations by team and type of surgery, time of operation, average concentration overall, average concentration from the time of detection, average concentration when N_2O gas was delivered, and average concentration after the N_2O was turned off

Table 3. Real-Time N_2O Concentrations By Team and Type of Surgery, Time of Operation, Average Concentration Overall, Average Concentration From the Time of Detection, Average Concentration When N_2O Gas was Delivered, and Average Concentration After the N_2O was Turned Off.

UCSF ORAL SURGICAL CLINIC – SUMMARY OF SURGERY TIME & N20 AVERAGES IN ppm FOR EACH OPERATION

OPER_#	UCSF1	UCSF2	UCSF3	UCSF4	UCSF5	UCSF6	UCSF7	UCSF8	UCSF9	UCSF10
TEAM #	1	1	2	3	3	4	3	3	2	2
OPER_TYP	MCANE	WISD4	WISD4	WISD4	WISD2	WISD4	IMPLA	TUBRE	WISD4	WISD2
TIME_OP(min)	32 5	39 3	52 3	62 3	43 8	45 5	100 0	62 0	51 2	38 0
N20_ON	18 5	31 0	36 8	15 3	21 0	27 8	17 8	18 8	45 6	27 5
%TIME_ON	56 9	79 0	70 3	24 5	48 0	61 0	17 8	30 2	89 1	72 4
N20_OFF	8 0	7 0	12 3	41 5	17 5	9 3	72 5	26 3	3 0	5 8
AVGALL(ppm)	66 5	108 3	136 5	47 9	60 3	112 8	5 5	62	27 3	34 6
MAX	361 0	794 3	1671 5	320 5	758 5	914 9	124 6	481 7	239 3	271 2
S D	82 7	110 0	210 9	60 9	105 8	163 5	16 2	66 6	34 7	43 0
AVGDET(ppm)	75 1	110 1	136 9	54 2	84 2	155 2	5 8	44 8	30 2	38 7
MAX	361 0	794 3	1671 5	320 5	758 5	914 9	124 6	481 7	239 3	271 2
S D	84 2	109 2	211 1	54 2	116 7	173 8	16 6	74 8	35 3	45 1
AVGON(ppm)	109 8	134 7	170 1	10 5	117 5	173 3	17 0	86 6	30 0	37 2
MAX	361 0	794 3	1671 5	80 7	758 5	914 9	124 6	481 7	239 3	271 2
S D	83 4	108 4	237 4	19 8	128 9	183 6	28 4	95 9	35 6	46 8
AVGOFF(ppm)	11 6	5 6	61 3	57 9	8 7	32 6	1 7	13 9	8 7	12 6
MAX	133 6	24 5	347 6	320 5	84 9	113 9	20 3	214 9	64 8	82 5
S D	31 8	6 8	82 2	64 8	16 0	33 7	3 5	27 0	14 9	16 8

CHANGES IN REAL-TIME N_2O CONCENTRATION RESULTING FROM WORK PRACTICES

Ten oral surgeries were performed on ten patients. There were five categories of oral surgery and four dental teams Analysis of the data was to determine (1) the mean concentration of N_2O and its standard error for all surgeries combined, (2) if there were significant differences among the four teams in N_2O level, and (3) if the N_2O level varied by type of surgery Each of these analyses was done for the periods for which the N_2O source was turned on, turned off, and the total time of the surgery The mean level of N_2O for the ten oral surgeries is shown in Table 4

Table 4 Mean Level of N_2O During Oral Surgery for all Ten Operations

Period	Mean	Std Error	Std Dev
GAS ON	88 7	19 6	61 9
GAS OFF	22 5	7 5	23 7
TOTAL	66 2	13 1	41 5

Note The estimates in the above table ignore possible differences among teams and/or dental surgeries

Analysis of variance was used to examine team differences overall for N_2O concentration when the N_2O was on, off, and for both periods combined during surgery The results suggest that team differences if any, are too small to be detected, statistical significance was not greater than 0 35 None of the pairwise differences among teams were large enough for statistical significance, even if each was treated as a planned comparison The mean N_2O levels by oral surgical team are shown in Table 5 Differences among types of dental operators were ignored for this analysis

Table 5 N_2O Levels by Oral Surgical Team

Team	Gas On		Gas Off		Total	
	Mean	Std Err	Mean	Std Err	Mean	Std Err
1	122 3	41 9	8 6	19 3	87 4	29 5
2	79 1	34 2	27 5	15 8	66 1	24 1
3	58 0	29 6	23 1	13 7	43 9	20 8
4	173 3	59 2	32 6	27 4	112 8	41 7

Analysis of differences among types of dental surgery was performed by analysis of variance, ignoring possible differences associated with dental teams Differences associated with type of dental surgery are too small to be detected with these data, the significance level was not greater than 0 5 The mean N_2O levels are shown in the following Table 6 None of the pairwise differences among surgery types were large enough for statistical significance, even when each was treated as a planned comparison

Table 6 N_2O Levels as a Function of Oral Surgery Type

Dental Surgery Type	Gas On		Gas Off		Total	
	Mean	Std Err	Mean	Std Err	Mean	Std Err
1	103 8	33 2	35 2	11 6	86 6	19 0
2	77 4	52 5	10 7	18 3	47 5	30 0
3	109 8	74 2	11 6	25 9	66 5	42 4
4	86 6	74 2	13 9	25 9	62 0	42 4
5	17 0	74 2	1 7	29 9	5 5	42 4

The next level of analysis looked at N_2O level as a function of N_2O percentage administered, and for changes in N_2O sampling probe distance during oral surgery

The analysis indicated that when N_2O percentage administered increases, the waste N_2O levels tended to increase The slope of the regression for waste N_2O is based on the concentration of N_2O administered The waste N_2O was estimated to be 14 ppm ($\pm$4 5) Thus, when N_2O is administered at 33 percent, the waste N_2O level is estimated to be 81 ppm This N_2O level is based on both the slope estimate, the intercept estimate, and a real-time sampling probe distance of 11 inches If the level of N_2O is administered at 40 percent, the waste N_2O level is estimated to be 95 ppm, while at 50 percent, the waste level is estimated to be 109 ppm

As probe distance was increased from the patient's mouth, there was generally a decrease in waste N_2O concentration The slope of the regression of waste N_2O levels, based on the distance from the patient's mouth and the probe used to measure waste N_2O, was estimated to be -7 ppm ($\pm$18) Thus, with each increase of 1 inch in the distance of the probe from the patient's mouth, the level of waste N_2O was estimated to decrease by 7 ppm

Statistical analysis was also performed to determine if there were significant differences in N_2O levels between the two surgical suites Table 7 shows the mean N_2O levels for when the gas was on, off, and overall While the observed N_2O levels were lower in Room D1222 versus Room D1218, the differences were not statistically significant

Table 7 N_2O Levels as a Function of Oral Surgical Suite

Room	Gas On		Gas Off		Total	
	Mean	Std Err	Mean	Std Err	Mean	Std Err
D1218	102 5	20 5	25 4	8 5	75 0	14 0
D1222	33 6	41 0	10 7	17 2	31 0	27 8
Sig (p)		0 2		0 5		0 2

GENERAL AREA SAMPLING

There were six locations where general area sampling was conducted in the surgical suite near the dental chair, the surgical suite air supply vent, the surgical suite exhaust, the surgical suite door, the hallway, and the appointment desk Results of the general area sampling data are shown in Table 8 The initial N_2O concentration in the rooms where N_2O was measured

Table 8 Results of the General Area Sampling Data

OPERATION NO	INIT CONC	ROOM SUPPLY	ROOM EXHAUST	ROOM DOOR	HALL	APPT DESK
UCSF1	<1	<1	4	<1	<1	<1
UCSF2	<1	<1	3	<1	<1	<1
UCSF3	<1	<1	<1	<1	<1	<1
UCSF4	<1	<1	<1	<1	<1	<1
UCSF5	<1	<1	1	<1	<1	<1
UCSF6	<1	<1	27	3	<1	<1
UCSF7	<1	<1	<1	<1	<1	<1
UCSF8	<1	<1	2	<1	<1	<1
UCSF9	<1	<1	8	2	<1	<1
UCSF10	13	<1	22	8	<1	<1

showed no detectable initial N_2O concentrations in nine of ten surgeries monitored by NIOSH personnel The 10th surgery showed 13 ppm prior to the N_2O being turned on It is suspected that there was some residual N_2O from the previous dental surgery, where this anesthetic was administered approximately 30 minutes before There was no N_2O detected in the surgical suite supply air, indicating that the N_2O was not being entrained into the building's supply ventilation or that the recirculation of this air diluted the levels below detectable limits The surgical suite exhaust air was low for all NIOSH-monitored surgeries The range was <1 to 27 ppm Operation #6 had the highest concentration at 27 ppm, with Operation #10 next at 22 ppm The real-time concentrations for these two operating suites were 173 ppm and 37 ppm,

respectively While the N_2O levels are comparable, there is no pattern that can be discerned by looking at the concentrations of the surgical suite exhaust air as a predictor of the real-time or personal breathing zone concentrations The N_2O concentrations were low at the door of each suite, ranging from <1 to 8 ppm, indicating that the rooms were not under positive pressure This was confirmed by using smoke from smoke tubes to observe the direction of air flow The hallway showed no detectable levels of N_2O, indicating that the N_2O was not migrating from the operating suites or being ventilated into the hallway from other sources No detectable levels of N_2O were observed at the appointment desk during this study

VENTILATION

General Ventilation

NIOSH researchers measured supply and exhaust airflows in the oral surgical Operatories D1218 and D1222 A plan view of the ventilation sampling areas and room layout is shown in Figure 5 The data is summarized in Table 9 Included in this table are the specified ventilation rates for these rooms and the results of an air balance survey made by Computer Engineering Design, Inc and Universal Test and Balance in August 1984

The air supply system consists of several units Blowers manufactured by Barry Blower, Model No 220, 70 BBC (DWDI), are used to supply air to several rooms including Rooms D1218 and D1222 It has a total specified capacity of 8645 cfm (690 cfm being dedicated to Rooms 1218 and 1222) The air is exhausted from these and other rooms by two of three exhaust systems manufactured by Barry Blower, Model 7600 AF (DWDI) The specified capacity of each of these two systems is 56,200 cfm (500 cfm being dedicated to Room D1218 and 190 cfm to Room D1222)

In 1984, the ventilation rates were within 10 percent of the original specifications By 1988, these rates were still within 13 to 18 percent in Room D1222, but 24 to 60 percent, on the low side, in Room D1218 In 1984, these two rooms were under positive pressure, the volume supply air exceeding the volume of air being exhausted In 1988, both rooms were now under negative pressure with the total volume of air exhausted being 60 to 180 cfm greater than the supply volume The remaining make-up air flows through the open door to each room

The dimensions of Room D1218 are 17 2 by 17 2 by 9 9 feet high, with a total volume of 2,300 cubic feet The ventilation to the room is supplied through one supply duct and the open door and exhausted through five ceiling registers The total air exhausted from this room provides an average of ten air changes per hour Eight dental procedures were monitored in this operatory

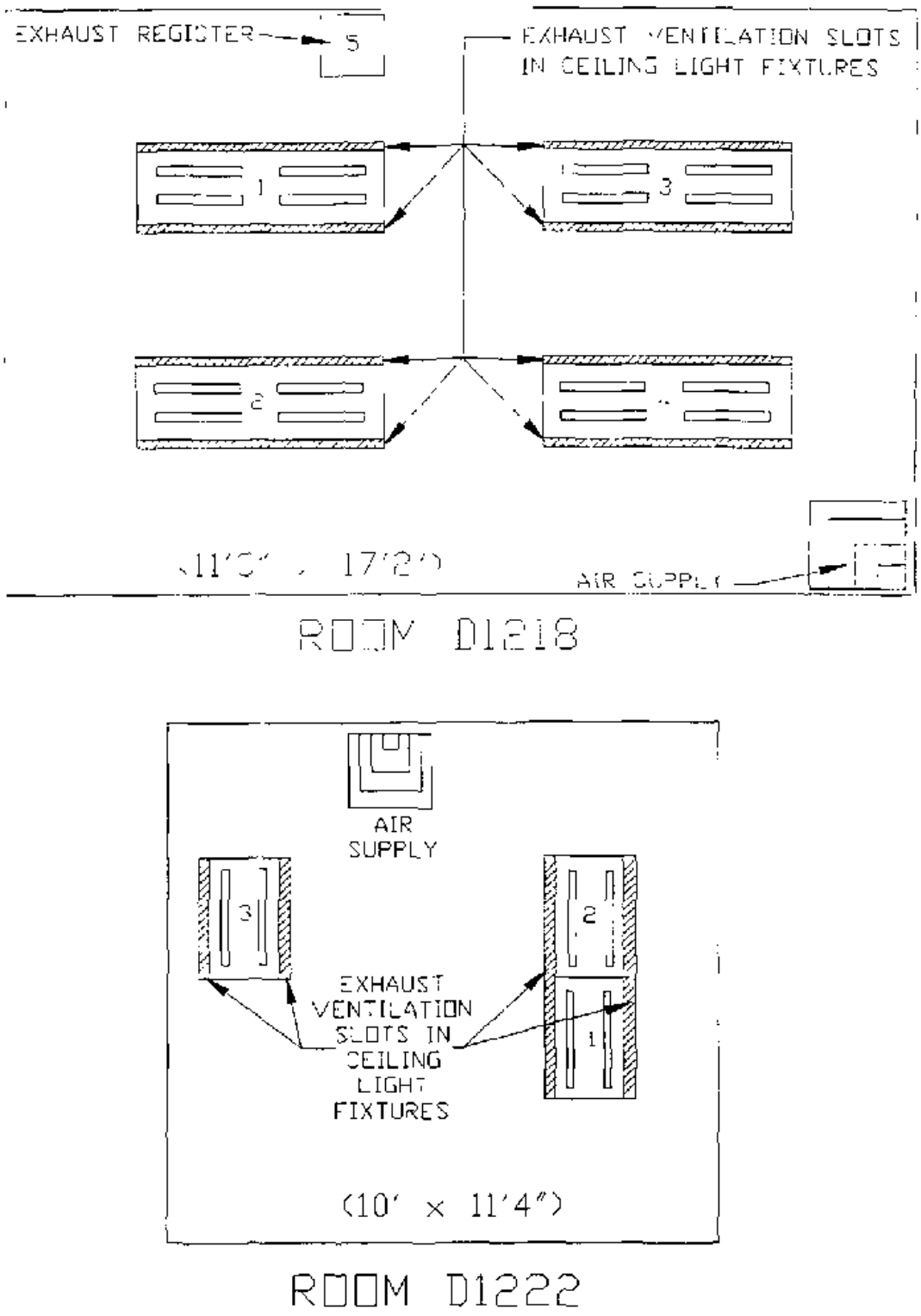

Figure 5 A Plan View of the Ventilation Sampling Areas and Room Layout

Table 9 The Measured Ventilation Data and Specified Ventilation Data for UCSF School of Dentistry Rooms D1218 and D1222

Room Number[a]	Measured by NIOSH in 7/88 (CFM)		Measured by CEDUTB in 8/84 (CFM)		Original Specification (CFM)	
	Supply	Exhaust	Supply	Exhaust	Supply	Exhaust
1218-1	-	35	-	45	-	50
1218-2	-	50	-	45	-	50
1218-3	-	160	-	280	-	300
1218-4	-	60	-	45	-	50
1218-5	-	75	-	45	-	50
1218-T	200	380	490	460	500	500
1222-1	-	80	-	65	-	50
1222-2	-	70	-	65	-	50
1222-3	-	0	-	0	-	45
1222-4	-	75	-	65	-	45
1222-T	165	225	210	195	190	190
Total for 2 rooms	365	605	700	655	690	690

a - 1218-1 is room number 1218, ventilation register 1. For 1218-T, this the total ventilation of all registers in room 1218.

CEDUTB - Computer Engineering Design, Inc. and Univeral Test and Balance

The dimensions of Room D1222 are 11 3 by 10 by 8 5 feet high, with a total volume of 960 cubic feet The ventilation to the room is supplied through one supply duct and the open door and exhausted through three ceiling registers The total air exhausted from this room provides an average of 14 air changes per hour Two dental procedures were monitored in this operatory

Smoke tube observations indicate that the supply air to each room remains near the ceiling and did not mix with the air in the rest of the room Additional measurements showed that the supply register louvers directed most of the air toward the ceiling and did not mix well with the air around the patient's oral surgical chair The general flow of the supply air moved from the left to right side

Scavenging System Ventilation

A Dwyer rotameter was connected to and exhaust flow rates adjusted to approximately 45 lpm after the gas was turned on for all oral surgeries monitored by NIOSH researchers In one operation, the scavenging system exhaust was not turned on until a few minutes after the gas was turned on (Operation #2) This was a procedural error by the surgical team, as they forgot to turn the exhaust valve on after turning on the anesthetic gas delivery unit to administer N_2O to the patient A member of the surgical team was notified that the exhaust valve was not turned on by a member of the NIOSH research team and this was subsequently corrected by the surgical team member If the gas delivery and exhaust system activation were somehow interconnected, this may eliminate this potential problem The exhaust valve for the scavenging unit is generally adjusted at the beginning of the operation by a member of the surgical team and not changed throughout the surgery

INFRARED SCANNING FOR NITROUS OXIDE

An infrared scanning camera was used for all oral surgeries monitored by NIOSH researchers in Room D1222 (Operations #1 through #8) The infrared camera was not used in Room D1218 because there was not enough room During some of the operations, it was observed that a sudden increase in N_2O exposure, observed from the real-time data, could be traced to the patient's expired breath, and when the patient would inspire, the N_2O levels would suddenly decrease This pattern of sudden changes in N_2O on the real-time data appear to indicate that patient mouth breathing was a factor in increased N_2O exposure to the oral surgeon and the surgical assistant Synchronization of the real-time data with the infrared scanner helped to confirm this source of exposure

The analysis of data for changes in real-time N_2O concentration as a function of work practices, the N_2O being turned on, the N_2O being turned off, the oral surgeon, the team, the type of surgery, percent of N_2O delivered, probe movement, and location were either too subtle, too confounded, or too few to show significant differences in N_2O concentration during this survey While certain patterns of N_2O exposure were observed between teams and real-time data, it cannot be determined at this point if additional sampling would have resulted in significant differences in the variables observed

DISCUSSION

Based on the results of these data, the major source of N_2O exposure for these oral surgical personnel appeared to be caused by patient mouth breathing, poor general room ventilation, and occasional poor nasal mask fit Generally, the waste N_2O concentrations were low compared to the percentage of this anesthetic gas being delivered (between 20 to 50 percent) Because of the controlled administration of the N_2O to the patient, the regulated and monitored exhaust of the waste N_2O through the scavenging system, the work practices of the surgical team, and the general good maintenance of the scavenging system, the only uncontrolled sources of exposure were mouth breathing by the patient, the occasional misalignment of the nasal mask when the patient's head was moved during the surgical procedure, and/or when the nasal cone did not fit properly Poor room ventilation, with regard to general air mixing, was noted during the survey Additional confirmation of poor room air mixing was visually documented by the infrared camera, in that the N_2O tended to linger in the breathing zone of the oral surgeons and surgical assistant when exhaled by the patient

PERSONAL SAMPLING

This in-depth survey showed that N_2O concentrations exceeded the NIOSH REL of 25 ppm during the time of administration in four of the ten operations by oral surgeons and in two of ten operations for the surgical assistants For the ten oral surgeries monitored, the Time-Weighted Average (TWA) N_2O exposures of the surgeons ranged from <1 to 277 ppm, and the TWA exposures of the surgical assistants from <1 to 77 ppm during the time of administration The oral surgeons had an average of 89 $\pm$114 ppm N_2O exposure, while surgical assistants had 26 $\pm$31 ppm Oral surgeons had an average of three times higher N_2O exposure than surgical assistants Oral surgeons had approximately the same exposures on average, compared to the real-time sampling location (89 $\pm$62 ppm) The difference between the oral surgeons and real-time N_2O results was not significant However, surgical assistants had, on the average, lower exposures (26 $\pm$31 ppm) compared to the real-time results (89 $\pm$62 ppm), the difference was significant ($p<.03$) The higher N_2O exposure for the real-time sampling and for the oral surgeons may be attributed to the sampling location of the probe and the closer working proximity of the oral surgeon to the patient's breathing zone

General ventilation also appeared to be a factor, as the random local air currents in both surgical suites slowly dissipated the waste gas from the patient's breathing zones Generally, the personal exposures were higher for the surgical staff working closest to the patient's breathing zone There were exceptions For example, during Operations #3, #9, and #10, the oral surgeon was left handed and worked on the patient's left side The exposures were generally lower ($X = 17 \pm 24$ ppm) than the surgical assistant who worked

on the patients's right side (24 ±35 ppm) Initially, it was thought that air currents from the ceiling supply ventilation may be channeling the air from the patient's left to right side and, therefore, exposing the surgical staff on the right side to more N_2O than the one on the left However, after looking at the infrared videotapes in detail, it was observed that this surgeon tended to work in a more erect posture over the patient's mid torso rather than above the patient's mouth This difference in location and posture appears to have been responsible for the lower N_2O levels of the surgeon relative to the surgical assistant, who's head was over the patient's head and closer to their breathing zone

GENERAL AREA SAMPLING

There were six locations where a total of 60 TWA general area bag samples were collected The majority of these samples showed no detectable concentrations of N_2O The remainder of these data showed concentrations below 25 ppm with one exception Operation #6 showed the average TWA at the supply exhaust to be 27 ppm These data are consistent when compared with the relatively high sampling results for Operation #6 at 173 ppm, and for the personal sampling results of the oral surgeon (138 ppm) and the surgical assistant (77 ppm) The initial N_2O concentration in the rooms where this gas was measured showed no concentrations in nine of ten surgeries monitored by NIOSH personnel There was no N_2O detected in the surgical suite supply air, indicating that the N_2O was not being entrained into the building's supply ventilation or that the recirculation of this air diluted the levels below detectable limits The N_2O concentrations were low at the door of each suite ranging from 0 to 8 ppm, suggesting that the rooms were not under positive pressure The hallway showed no detectable levels of N_2O, indicating that the N_2O was not migrating from the operating suites or being ventilated into the hallway from other sources No detectable levels of N_2O were observed at the appointment desk during the NIOSH study

It appears that based on the general area sampling, that N_2O does not readily diffuse into the air and that pockets of N_2O could slowly migrate in the surgical suite, depending upon the direction of ventilation and random air currents generated by the movement of personnel in the suite

SCAVENGING SYSTEM VENTILATION

The exhaust valve setting is adjusted by a member of the surgical team prior to beginning dental surgery This exhaust valve is connected to the breathing hose approximately 7 feet from the scavenging mask The rotameter, which measures the flow of exhaust air, is connected to the hose above the valve which is connected to an exhaust port located on the wall of the dental operatory When the valve is opened, the air at the mask is exhausted into the line and through the rotameter The amount of exhaust air flow was adjusted to approximately 45 lpm for each operation In all but one operation, the exhaust valve was turned on prior to administering N_2O to the patient (Operation #2) The rotameter is attached to the wall near the exhaust valve and can be observed by a member of the surgical team at any time The rotameter used in this study is part of the scavenging system and has convenient markings where the flow ball should be when adjusted to the

proper exhaust levels of 45 lpm (Figure 6) The advantage of a rotameter is that the oral surgeon can visually observe the exhaust flow rate

REAL-TIME SAMPLING AND WORK PRACTICES

The specific effects of work practices on changing N_2O concentrations were not apparent for most of the operations monitored by the NIOSH researchers There were several work practice elements that were monitored, such as the time (in minutes) of oral surgery, concentration of N_2O administered to the patient, changes in the concentration administered to the patient, the use of surgical tools, movement of the sampling probe during surgery, and surgical operations such as tooth drilling and tooth removal Other aspects of the surgery also were evaluated including patient talking, yawning, or mouth breathing (the use of infrared thermography helped with our interpretation), the type of mask used (all were Porter-Brown masks, with the exception of Operation #8 in which the MDT McKessen was used), and the type of dental operation performed, which ranged from the removal of wisdom teeth to tooth implantation

The most important predictive elements for N_2O concentration were when the oral surgeon turned the N_2O on, adjusted the N_2O percentage during surgery, and when the dentist turned the N_2O off Another important predictor was patient talking and/or patient mouth breathing Patient mouth breathing was observed on the infrared camera This became very evident when examining Operation #4 The patient was instructed prior to surgery not to mouth breathe and to breathe through the nose, as were the other patient's prior to surgery The infrared camera showed that the patient cooperated with the oral surgeon's request until he began to extract the patient's wisdom teeth Until this point, very low levels of N_2O were detected However, after the surgeon started to extract the patient's teeth, the patient began to mouth breathe This was detected, not only by the infrared camera, but also by the Miran 1A as the levels began to climb to peak levels of over 300 ppm (See Appendices A and B, Operation #4) The most interesting aspect of this operation is that the N_2O was detected only after the gas was turned off by the oral surgeon The patient then became the source of waste N_2O by mouth breathing Even more interesting, is that the average N_2O level during the time of administration was 11 ppm for the real-time sampling probe However, after the N_2O was turned off, the average concentration was 68 ppm The time of administration was only 15 25 minutes, but the time of N_2O detection was 55 minutes and the time in which N_2O exceeded 25 ppm was nearly 44 minutes, which indicated poor general ventilation

In-depth statistical analysis of differences in N_2O levels among the oral surgical teams, type of surgeries, and rooms, respectively, did not discern statistically significant differences that could be inferred with confidence However, the range of N_2O levels would suggest that there may have been differences between operations For example, compare the overall N_2O level of 136 ppm for Operation #3, versus 6 ppm for Operation #7 The reason significant differences were not found may have been (1) the wide variance in N_2O levels within and between operations, and (2) the relatively small number of operations evaluated for such differences The variance in N_2O levels was most likely caused by patient exhalation through the mouth

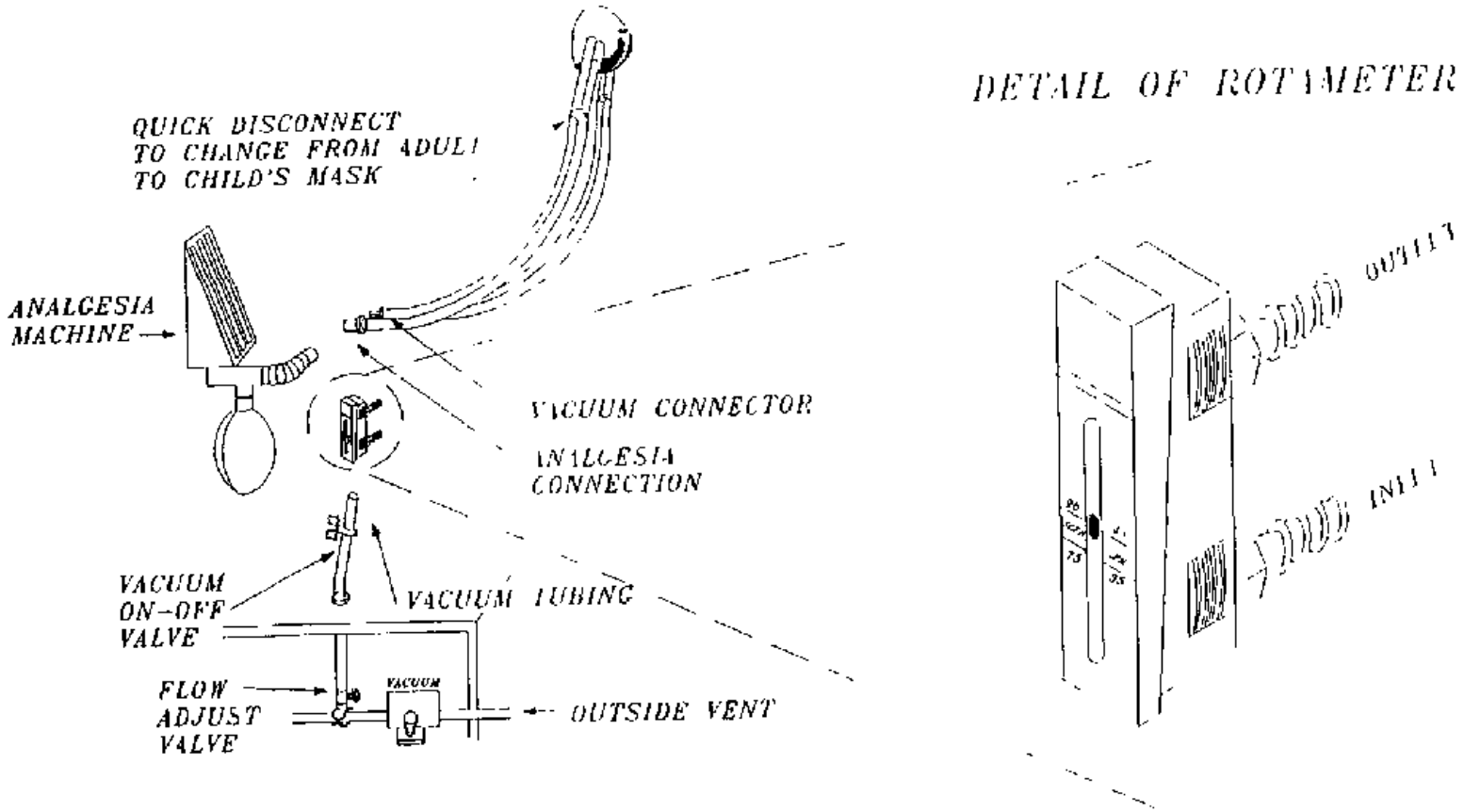

Figure 6. The N_2O Delivery and Scavenging System With Detail of Rotameter to Evaluate Air Exhaust Flow Rate

Further analysis showed the variance in N_2O levels also were caused by patient mouth breathing, in which (1) air currents from the room randomly directed N_2O into the real-time sampling probe, and (2) the patient's mouth was inadvertently aligned by the oral surgeon to the real-time sampling probe in which the patient exhaled N_2O directly into the probe This alignment was dependent on the oral surgeon's movement and orientation of the patient's head while performing oral surgery The infrared scanning of N_2O during surgery, discussed in-depth in the next section, shows visual evidence that the sudden changes in N_2O levels may have been caused by the two elements mentioned above

Changes in N_2O levels also were observed when the N_2O delivered to the patient varied from 30 to 50 percent Statistical modeling showed that, as the concentration of N_2O increased by 10 percent, there was a 14 ppm increase in waste N_2O levels Statistical modeling also showed that changes in N_2O levels were a function of changing probe distance For every inch the probe was moved from the patient's mouth, there was a decrease of 7 ppm in waste N_2O These changes did not appear to significantly influence overall N_2O levels for the real-time monitoring A statistical summary of the major contributors for N_2O concentration and changes in N_2O concentration by operation is shown in Appendix C

INFRARED SCANNING FOR NITROUS OXIDE

The infrared scanning camera proved to be a valuable tool in determining N_2O leakage from the patient's mask, and from patient mouth breathing By following the real-time data patterns, NIOSH researchers could discern when there was a mask leak, when the patient was mouth breathing, or both The infrared camera was also useful in evaluating the direction and dispersion of N_2O after it was exhaled from the patient The surgical team member with the higher N_2O level tended to be located closer to the patient's breathing zone Typically, this was the oral surgeon However, in some cases, the oral surgeon worked further away from the patient's breathing zone, which resulted in potentially lower N_2O concentrations This is important, since the air levels of N_2O may not have been less than in other operations, but that the breathing zone was further away and, therefore, lower N_2O concentrations were detected The infrared camera was also able to help detect patient mouth breathing, by showing N_2O escaping from the patient's mouth at regular intervals, it was thought that this pattern was tidal volume breathing

This ability to determine these exposure sources is helpful in providing recommendations in reducing overall exposure One of the observations made by using the infrared scanning camera is that N_2O does not appear to disperse evenly when the patient mouth breathes It appears that when the N_2O is emitted from the patient's mouth, it rises in a somewhat narrow plume The surgical team member may be in the direct path of this plume, if so, this results in a "spike" exposure In other cases, the surgeon may miss the plume all together In other cases, this plume can enter the breathing zone of the surgical assistant, or directly into the real-time sampling probe Sometimes this plume can hit or completely miss all three Exposure was somewhat dependent upon the random currents of the room, the patient contribution, and the location of the surgical team Generally, if the oral surgeon is working

very close to the breathing zone of the patient, then the surgeon has a greater probability of being exposed The infrared scanner helps explain some of the problems in examining the real-time data to determine surgical work practices as a function of exposure

The location of the sampling probe can be very critical with regard to detecting waste N_2O If the probe is placed too far away from the patient's breathing zone, the readings may be lower and not represent true exposure If the probe is too close to the patient, it may get "spikes" of N_2O from the patient and show peak exposures over 1,000 ppm Statistical analysis of N_2O concentrations showed this generally to be the case, as the real-time sampling probe was moved further away from the patient, there was a tendency for the overall exposure to decrease

Because of the potential variability in collecting real-time samples, the usefulness of this technique is limited, with regard to correlating surgical practices with exposure If real-time sampling is conducted to correlate surgical practices with exposure, it may be better to attach the real-time sampling probe to the surgeon's lapel

MAINTENANCE

During these surveys, NIOSH researchers observed that the N_2O scavenging equipment was in good repair including the gas cylinder delivery area, the gas delivery system, and the high to low pressure connectors at the surgical suites It also was observed that replacement parts were available when needed This was noted when, prior to surgery in surgical suite D1222, one of the NIOSH researchers examined the rebreathing bag of the N_2O/O_2 delivery unit and noticed that the bag had a small tear in it, and could leak N_2O into the room when the unit was turned on The rebreathing bag was immediately replaced with a new bag, when the surgical team was informed It is recommended that periodic preventive maintenance of equipment be a major part of the program to avoid exposure to N_2O Equipment should be inspected by the surgical team for malfunctions, such as improper connections of anesthesia hoses, rebreathing bags, and scavenging masks prior to each dental surgery The oral surgeon and surgical assistant should also inspect the connection fittings, bags, and masks for cracks and tears due to general wear and degradation, and replace these items as needed

EDUCATION AND TRAINING OF DENTAL PERSONNEL ON THE USE OF N_2O SCAVENGING EQUIPMENT

In discussions with the oral surgeons and surgical assistants, it was determined that there is very little instruction on the use and maintenance of scavenging equipment While the system evaluated by NIOSH researchers comes with instructions from the manufacturer, these instructions are usually discarded when the scavenging equipment is removed from its plastic wrapping This may be a communication problem between the manufacturer, the seller, and the user NIOSH researchers observed that instruction on how to operate the scavenging units appeared to be word-of-mouth, with each oral surgeon and surgical assistant having their own style in using the scavenging equipment Improving instructions and providing educational updates by the manufacturers

to sellers and users may help reduce overall N_2O exposure by more efficient and prudent use of such systems

PRUDENT USE OF N_2O DURING PATIENT ADMINISTRATION

It was noticed that there was variability in the concentration of N_2O delivered to the patient as well as the duration Surgical teams ranged from 33 to 50 percent for N_2O delivered to the patient, and from 18 to 88 percent of the total time of the operation in which N_2O was administered (Figure 7) The differences appeared to be based on the preference of the surgical team leader for each patient and not upon the type of operation performed Note that the N_2O concentration and ranges above were for the removal of four wisdom teeth and was performed on each patient, but by two different surgical teams There was also a trend noted that the surgical teams were somewhat consistent in the use and duration of N_2O for their patients Meaning that the surgical team leaders were consistent in the concentration and duration of N_2O administered more as a personal preference rather than what the patient needed or the type of surgery performed

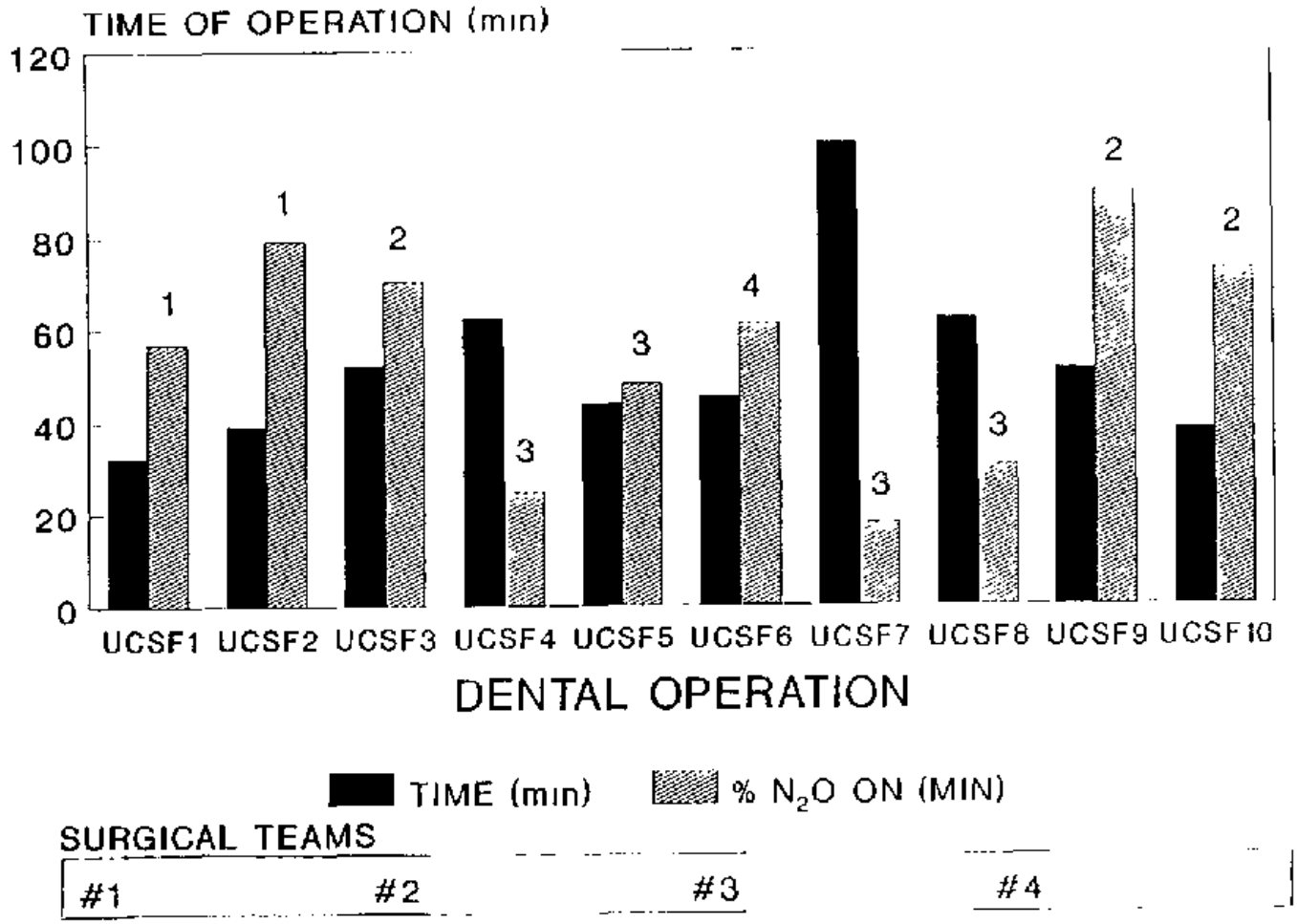

Figure 7. Time of Operation for Oral Surgery - UCSF-Oral Surgical Clinic

CONCLUSIONS

Personal exposure for waste N_2O concentrations from the ten operations ranged from <1 to 277 ppm for the oral surgeons and from <1 to 77 ppm for the surgical assistants The average N_2O concentrations for the oral surgeons was 89 (±114), for the surgical assistants 26 (±31 ppm) Oral surgeons were overexposed to N_2O anesthetic during Operations #1, #2, #6, and #9 Surgical assistants were overexposed to N_2O in Operations #6 and #9 Real-time N_2O concentrations ranged from <1 to 177 ppm Peak values of over 1,000 ppm N_2O were recorded for Operations #3 and #6 The operation with the highest real-time average values was Operation #2, at 277 ppm, and #1, at 236 ppm Generally, personal sampling and real-time sampling correlated with the oral surgeons (89 ppm), surgical assistants were lower (26 ppm) The oral surgeons had a greater range of exposure (<1 to 277 ppm) compared to the real-time results (11 to 173 ppm) and the surgical assistants (<1 to 77 ppm) These differences (significant between the oral surgeon and surgical assistant $p< 001$) may be attributed to the closer working proximity of the oral surgeon to the patient's breathing zone Work practices and changes in N_2O concentration, as a function of work practices, were most affected by the regulation of anesthetic gas delivery, including the amount of N_2O delivered and the length of time the N_2O was delivered, the breathing zone of the oral surgeon relative to the patient's, and if the patient was instructed to nose breathe and reduce talking when possible Other work practices, such as the use of dental surgical tools and oral surgery techniques, did not influence N_2O change General ventilation measurement showed that the surgical suites were below specifications for air flow, 18 percent below for Room D1222 and 60 percent below specifications for Room D1218 Smoke tubes used to visualize the flow of room air indicated poor mixing where the supply air did not mix with air in the rest of the room and that air movement was random

RECOMMENDATIONS

The oral surgeon's and surgical assistant's N_2O exposure was primarily from patient mouth breathing. A reason for the oral surgeon is higher exposures was from the closer working proximity of the surgeon to the patient's breathing zone Control of N_2O from patient mouth breathing may be through the use of an auxiliary exhaust system placed near the patient's mouth Improved general ventilation, which offers better room air mixing, should also reduce N_2O concentrations Research on auxiliary exhaust systems for this purpose has shown promise in reducing N_2O levels in the dental operatories [54] Additional recommendations for controlling N_2O fall into several categories including General Equipment Maintenance, the Scavenging System, Work Practices, Ventilation, Environmental Monitoring, and Administrative Controls Listed below are specific recommendations for controlling N_2O inhalation by dental personnel during patient surgery at this facility

GENERAL EQUIPMENT MAINTENANCE

The analgesia equipment contains several rubber components, which may be degraded by the N_2O as well as through repeated sterilization for infection control It is recommended that all rubber hoses, connections, tubing, and the breathing bag be frequently checked to assure that this equipment is in good working order Leak testing can be performed according to the manufacturer's recommendations or by the procedures outlined in the "Leak Testing Scavenging Equipment" section of this report For gas cylinders, Teflon tape is recommended for all metal-threaded connections through which N_2O flows High to low pressure connections should also be checked regularly, as the o-rings may become worn and a N_2O leak source

THE SCAVENGING SYSTEM

The exhaust rates used during this survey were approximately 45 lpm Flow rates less than this average may result in an increase in N_2O through leakage from the patient's nasal cone, and thus may not reduce N_2O to the NIOSH REL of 25 ppm during administration It is recommended that a flow metering device, such as a rotameter, always be used to monitor the proper exhaust flow rates A bypass rotameter may have an advantage over an in-line rotameter, because it avoids moisture problems in the vacuum line and potential false readings by the rotameter ball and airflow scale

For the scavenging mask, leaks around the mask may be kept to a minimum if the proper anthropometric size is selected It is suggested that prior to surgery the mask should be gently but securely fastened to the patient's nose by using the slip clamp connected to the analgesia hoses which gather near the back of the patient's head and dental chair headrest

Suction pumps should have enough power to maintain scavenging flow at the nasal mask at 45 liters per minute Suction pumps should also have enough power to overcome the static pressure drop associated with the maximum number of installed or "designated" in-line scavenging units which are operated at the same time

All suction pumps aspirating air N_2O contaminated from the patient's mask or mouth should be vented outside the building and away from fresh air inlets

WORK PRACTICES

The oral surgeons and surgical assistants should inspect the anesthesia machines and all connections prior to starting anesthetic gas administration Breathing bags should be attached to the anesthesia machine and hoses and clamps should be in place prior to turning on the anesthetic gas

The scavenging mask should be properly connected to the gas delivery hose and the vacuum system The Porter-Brown scavenging mask is designed with different diameter hoses to reduce the possibility of incorrect connection of the gas delivery and scavenging hoses

It is recommended that the N_2O not be turned on until (1) the vacuum system scavenging unit is turned on to the recommended flow rate of 45 lpm, and (2) the scavenging nasal cone is placed over the patient's nose prior to surgery

To reduce leaks around the nasal cone during gas delivery, use the slip clamp which is attached to the scavenging nasal inhaler hoses to seat the mask more securely on the patient's nose

Flush oxygen through the analgesia equipment following dental surgery, especially the breathing bag, prior to disconnecting the gas delivery system, and prior to turning the scavenging system vacuum off

VENTILATION

It is recommended that the supply register louvers located in the ceiling be designed so as to direct the fresh supply air toward the floor and toward the dental chair to provide better mixing, dilution, and removal of the contaminated air from the operating room

A minimum of ten total air changes per hour is recommended for dental operatories which use N_2O Recirculating room air is not recommended, and should be exhausted outdoors and away from air intake vents The Department of Health and Human Services' publication entitled "Guidelines for the Construction and Equipment of Hospital and Medical Facilities" [Publication No (HRS-M-HF) 84-1, 1984] lists more detailed information regarding ventilation guidelines [53]

Install sweep fans where general ventilation is inadequate or where supplemental ventilation is needed An air velocity of approximately 25 cfm at a distance of 3 feet from the patient's head is recommended [5]

ADMINISTRATIVE CONTROLS AND ENVIRONMENTAL MONITORING

When N_2O is used, the waste gas should be reduced to the lowest achievable level It is recommended that N_2O exposures should be no greater than 25 ppm during administration [55]

It is recommended that annual reviews of N_2O use be evaluated, as well as reviews of waste gas reduction program The annual review should include environmental air monitoring, leak testing of equipment, and personal and environmental monitoring Air monitoring may be performed either by gas bag sampling, real-time sampling, and/or by passive dosimetry

Dentists should request information from dental equipment suppliers on the proper use of the equipment and its effectiveness in reducing N_2O prior to purchase

FOLLOW-UP EVALUATION

Sampling to confirm the efficiency of the controls should be conducted after the above recommendations have been implemented

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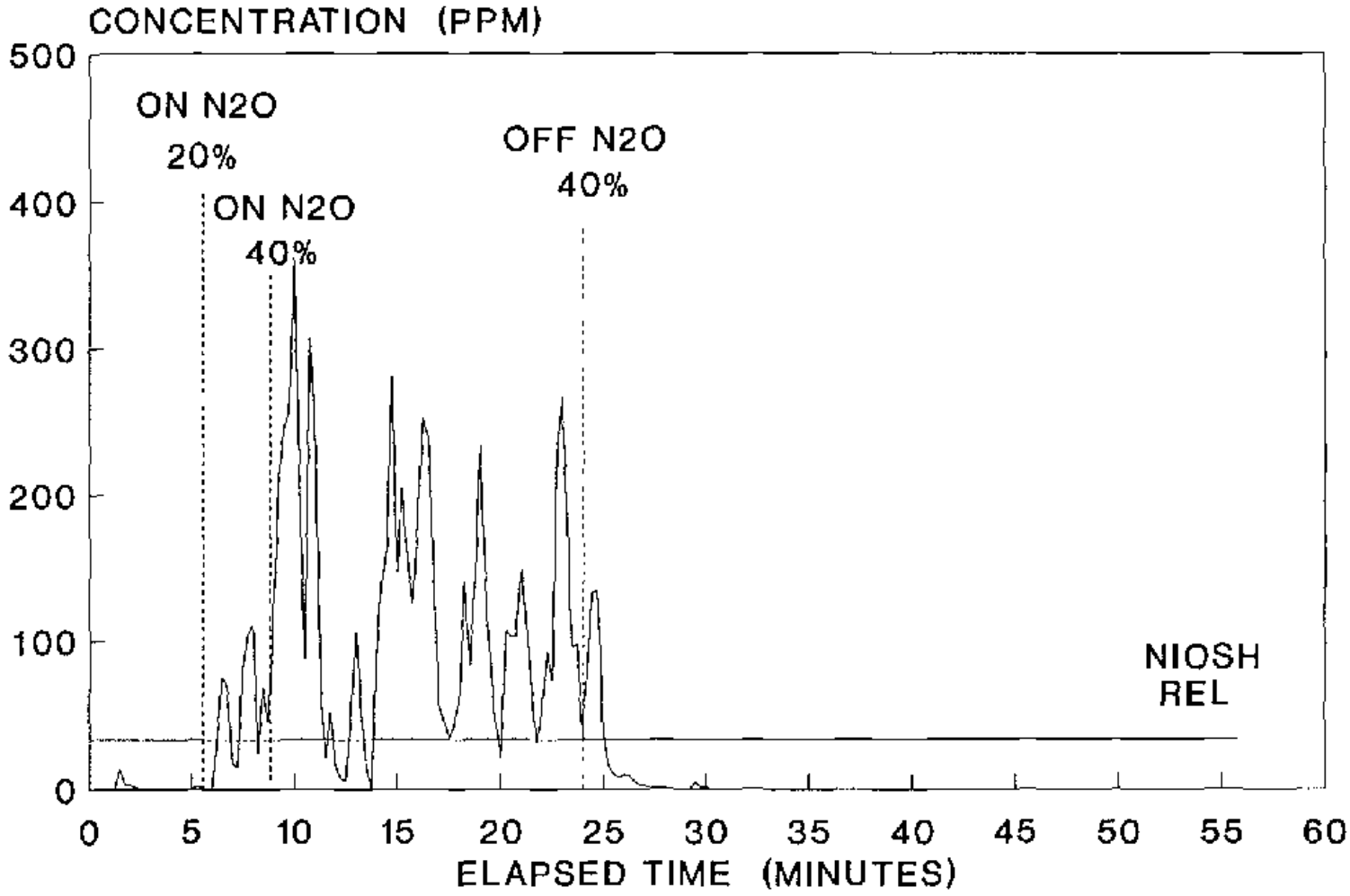
APPENDICES

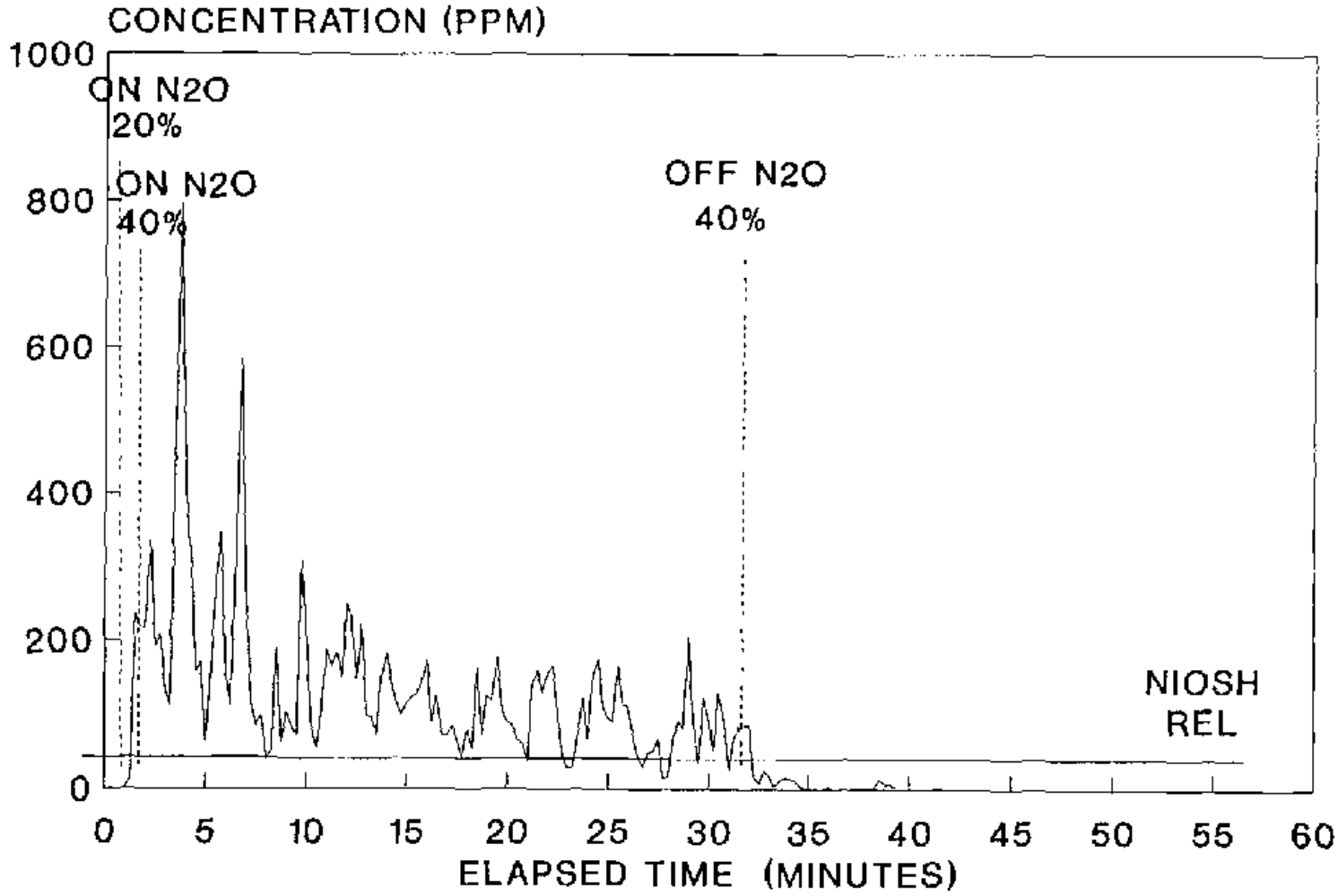
APPENDIX A

N_2O CONCENTRATION VERSUS ELAPSED TIME FOR EACH DENTAL OPERATION

N2O CONCENTRATION VERSUS ELAPSED TIME
DENTAL OPERATION #1 UCSF



N2O CONCENTRATION VERSUS ELAPSED TIME
DENTAL OPERATION #2 UCSF



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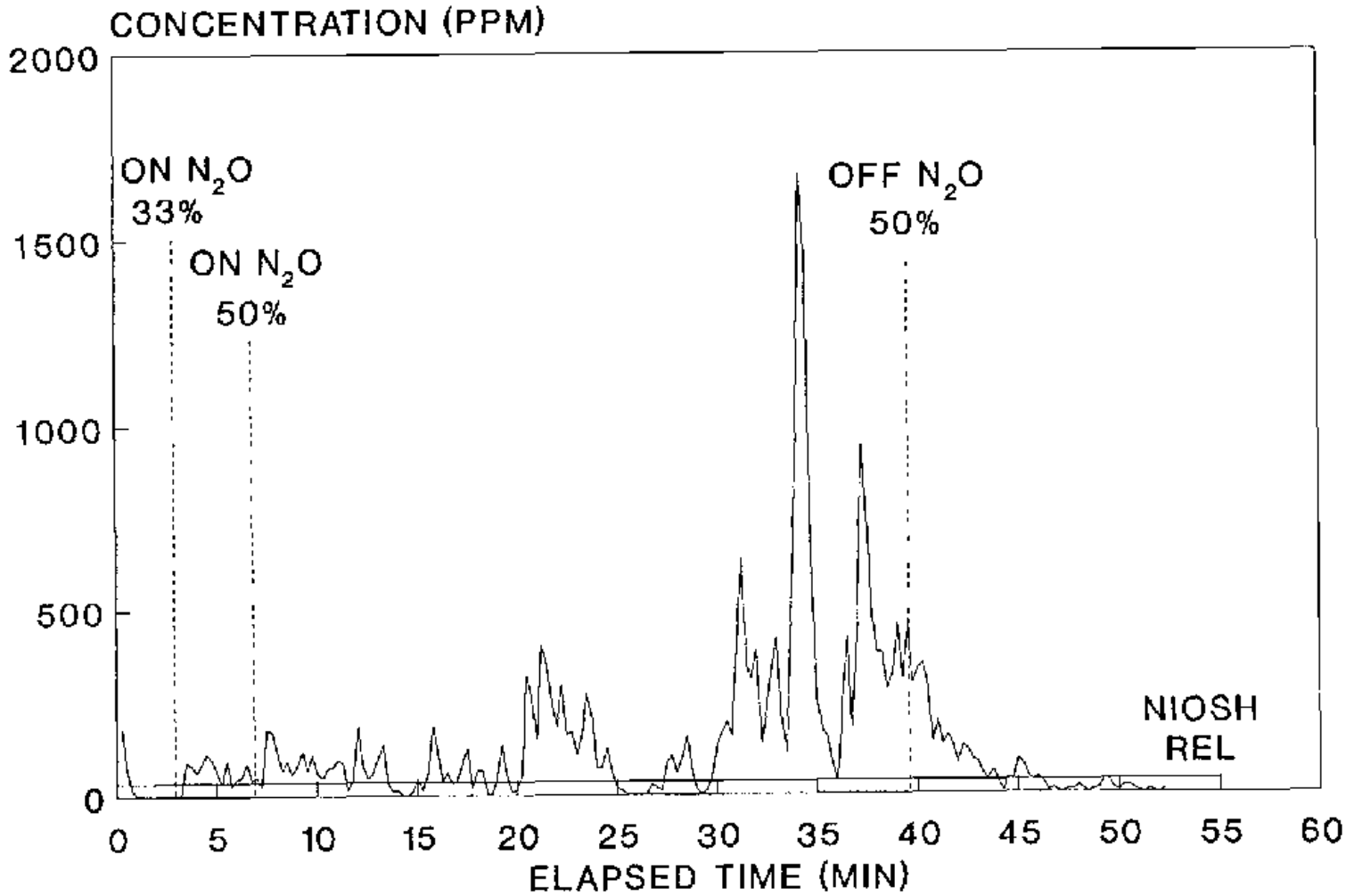

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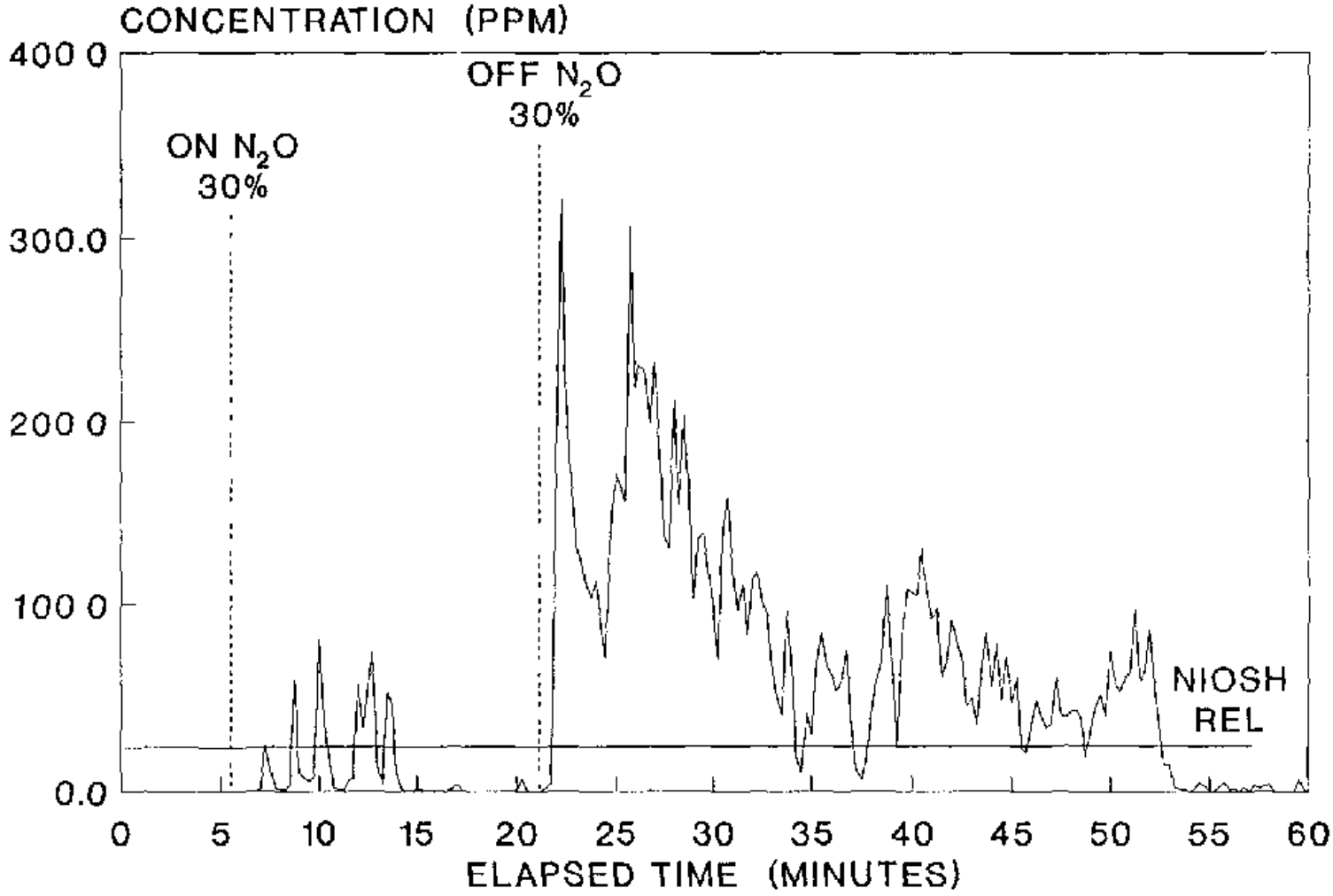

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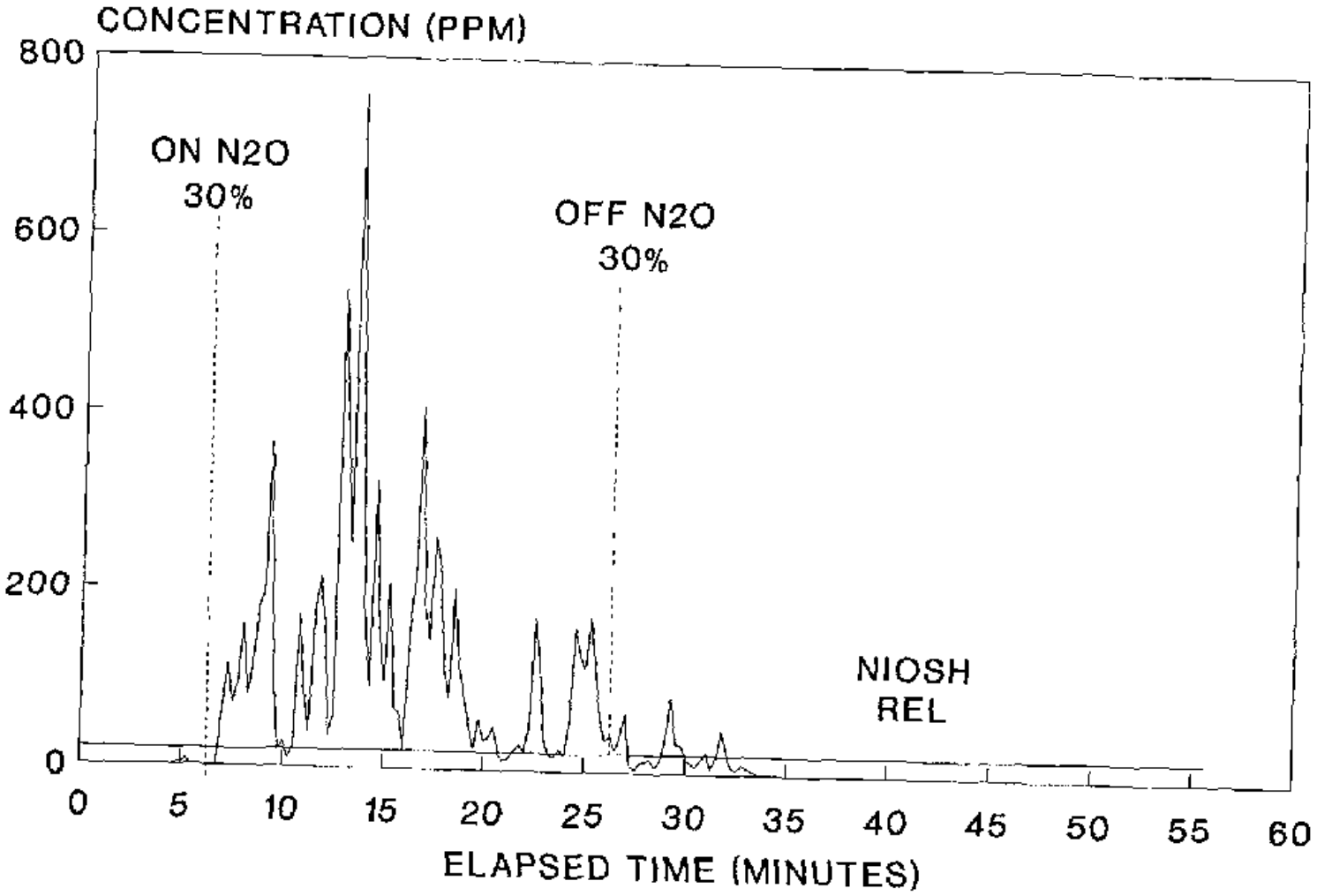
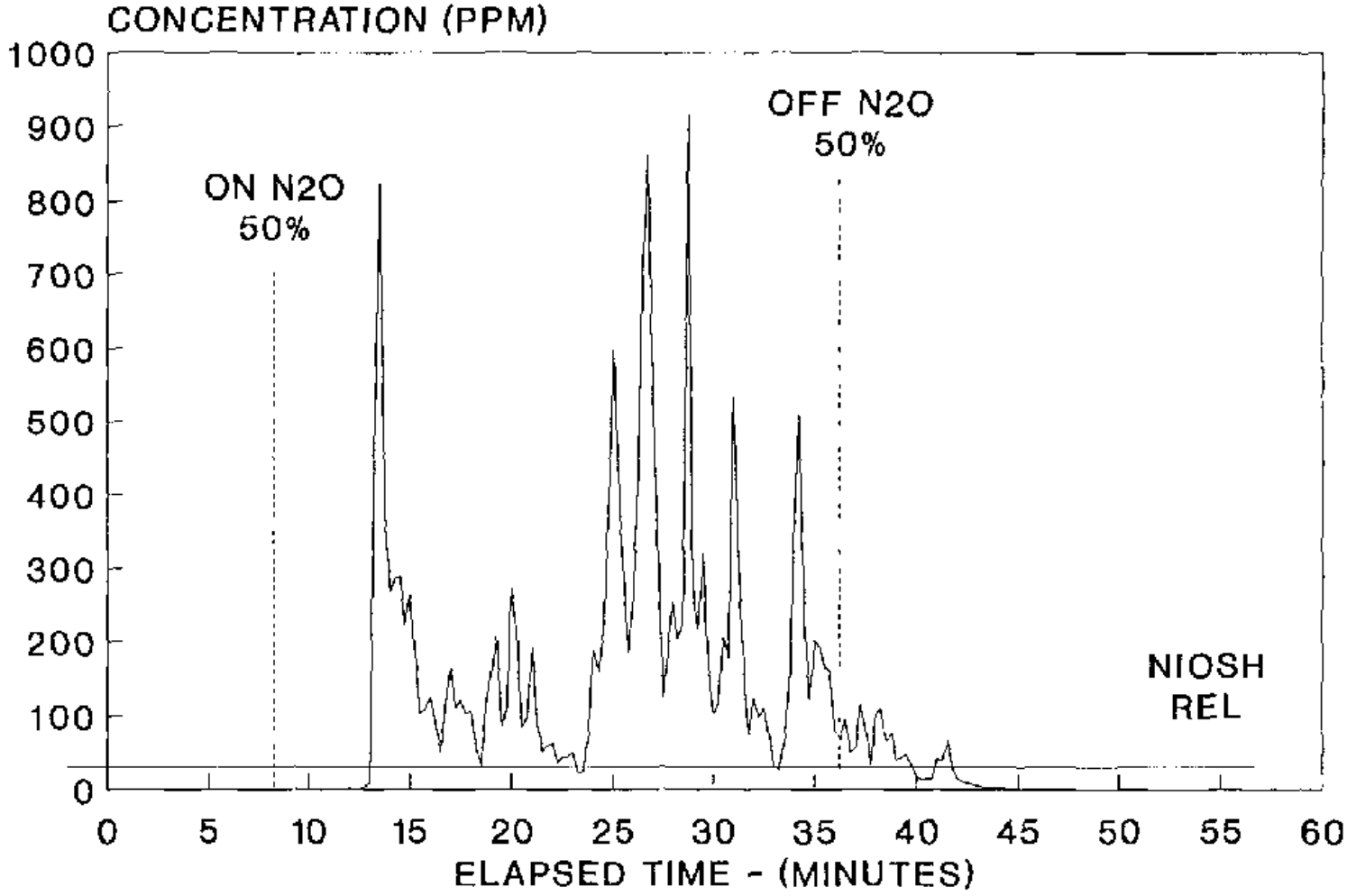
DENTAL OPERATION #5 UCSF



N2O CONCENTRATION VERSUS ELAPSED TIME
DENTAL OPERATION #6 UCSF



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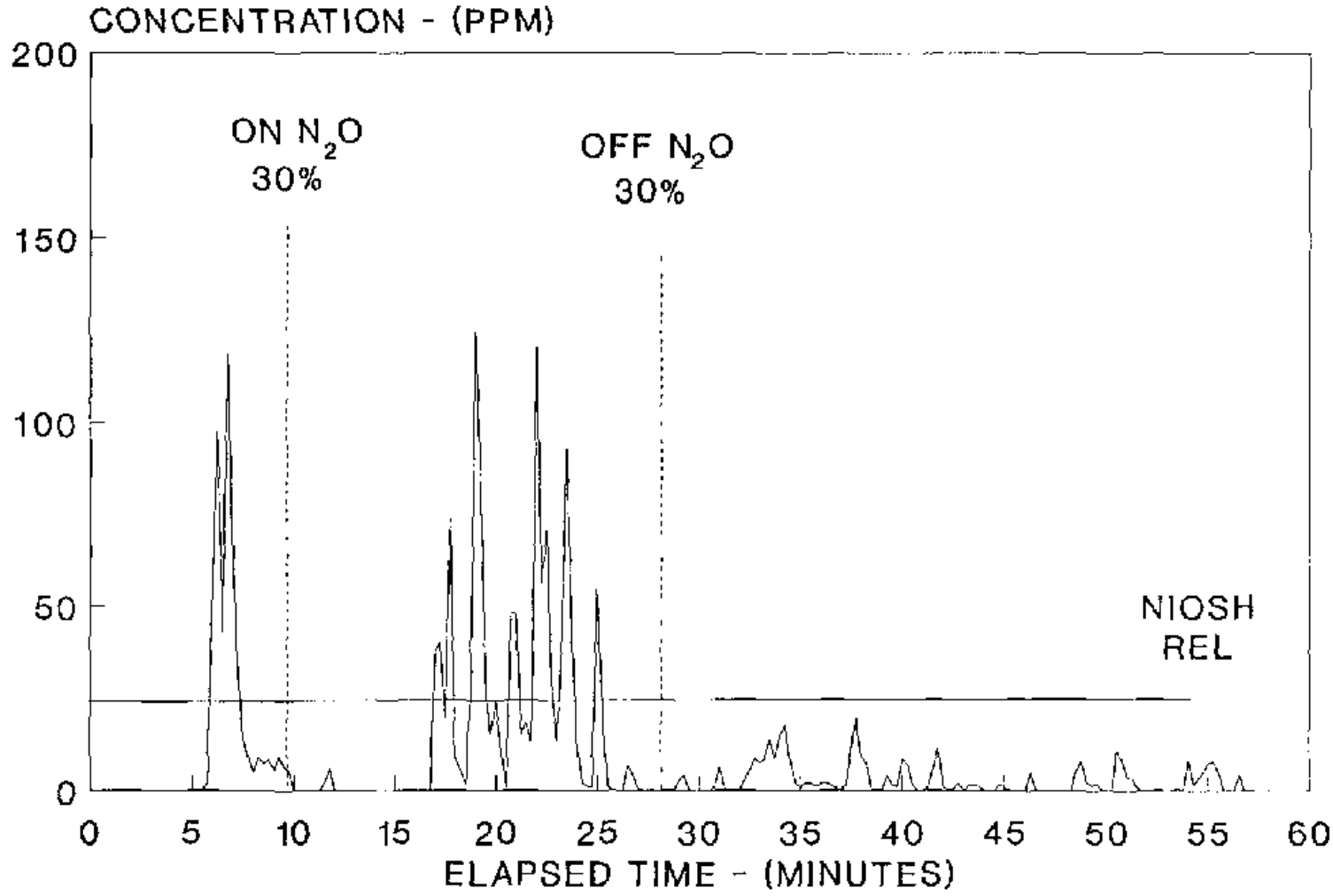
DENTAL OPERATION #7 UCSF



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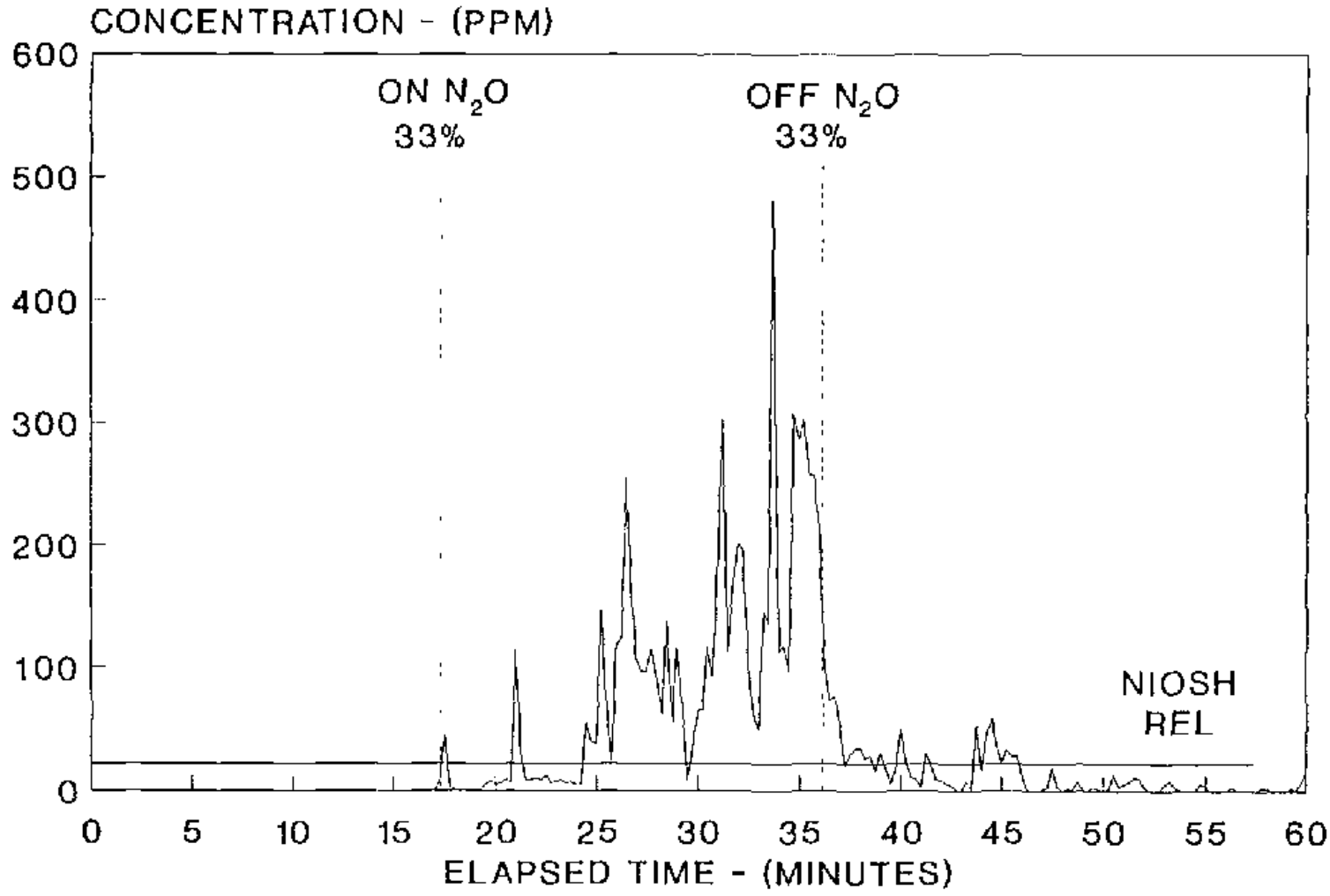
DENTAL OPERATION #8 UCSF



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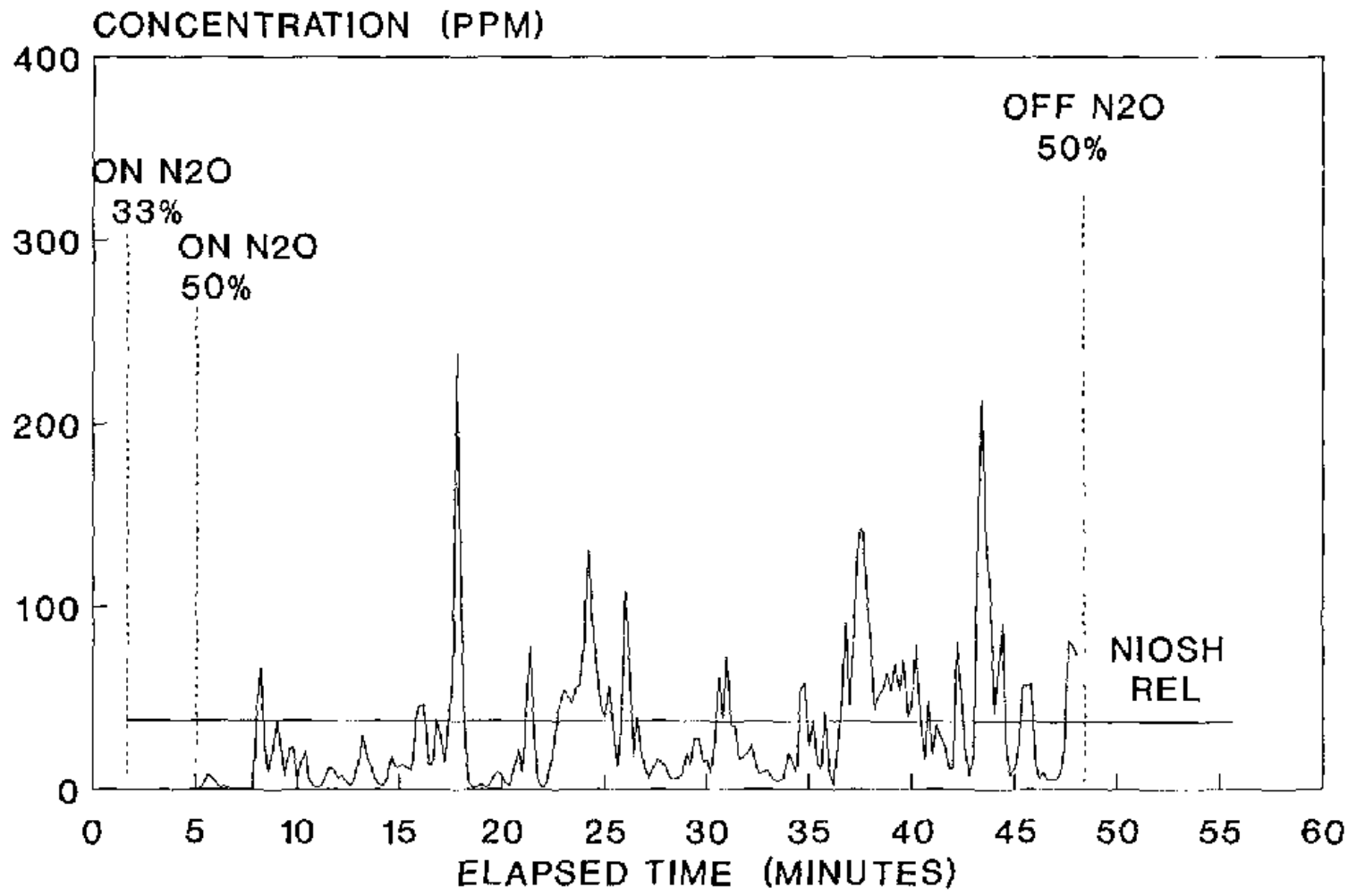
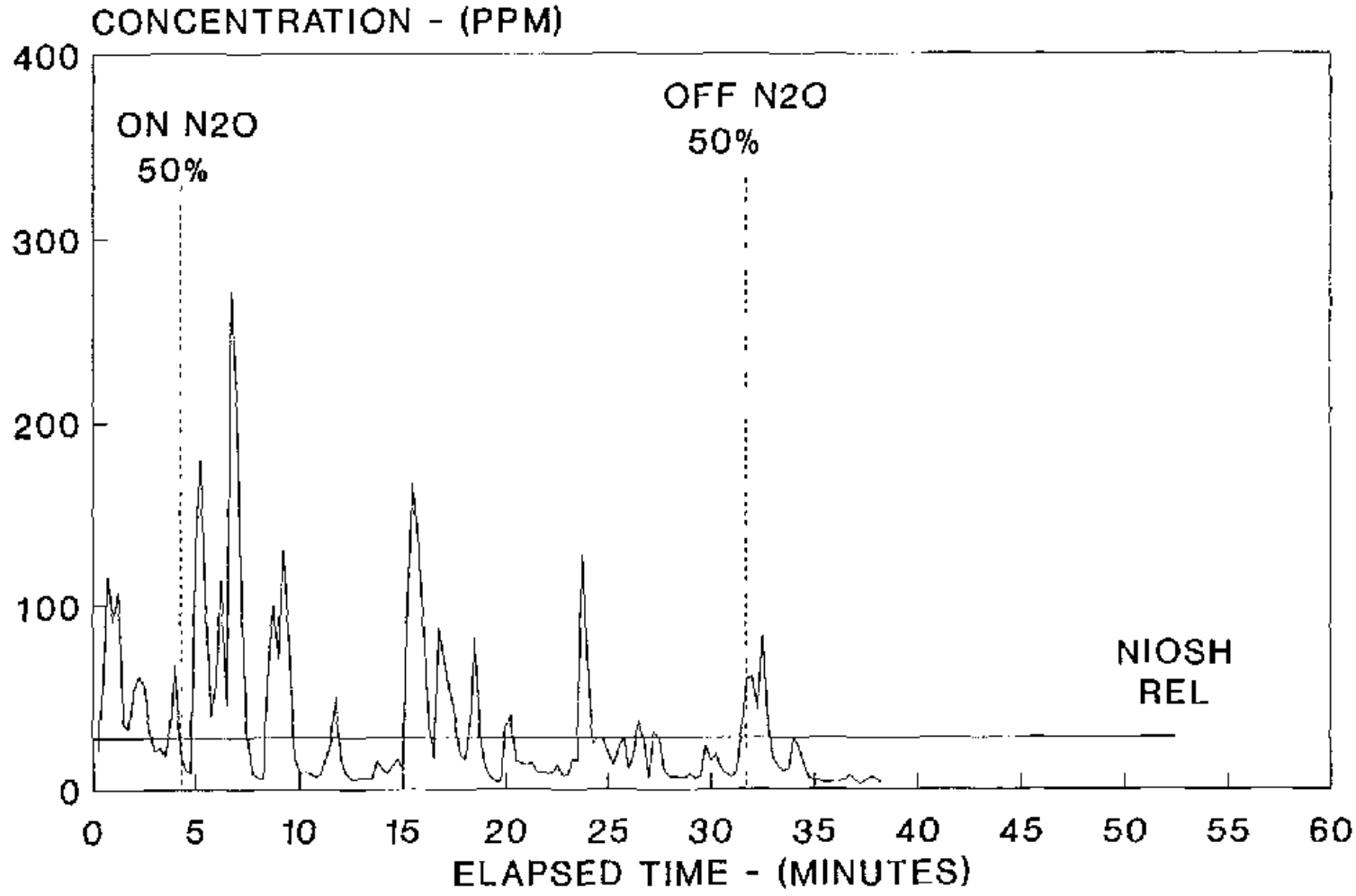
DENTAL OPERATION #9 UCSF



N2O CONCENTRATION VERSUS ELAPSED TIME
DENTAL OPERATION #10 UCSF



APPENDIX B

NITROUS OXIDE CONCENTRATION VERSUS ELAPSED TIME FOR OPERATIONS 1 THROUGH 10 AT THE UNIVERSITY OF CALIFORNIA AT SAN FRANCISCO ORAL SURGICAL CLINIC

UCSF1 TEAM 1, FEMALE-70, ORIENTAL, POOR CONE FIT, REMOVE MANDIBULAR CANINE

TIME MIN	CONC PPM	N2O %	PULL POKE	PROBE DIST.	PATIENT						MASK TYPE	DENT TEAM	DENT OPER
					INJECT	ASPIR	WATER	TALKING	DRILL	OTHER			
0 25	0	0	0	0	0	0	0	0	0	0	1	1	3
0 50	0	0	0	0	0	0	0	0	0	0	1	1	3
0 75	0	0	0	0	0	0	0	0	0	0	1	1	3
1 00	0	0	0	0	0	0	0	0	0	0	1	1	3
1 25	0	0	0	0	0	0	0	0	0	0	1	1	3
1 50	14	0	0	0	0	0	0	0	0	0	1	1	3
1 75	3	0	0	0	0	0	0	0	0	0	1	1	3
2 00	3	0	0	0	0	0	0	0	0	0	1	1	3
2 25	1	0	0	0	0	0	0	0	0	0	1	1	3
2 50	0	0	0	0	0	0	0	0	0	0	1	1	3
2 75	0	0	0	0	0	0	0	0	0	0	1	1	3
3 00	0	0	0	0	0	0	0	0	0	0	1	1	3
3 25	0	0	0	0	0	0	0	0	0	0	1	1	3
3 50	0	0	0	0	0	0	0	0	0	0	1	1	3
3 75	0	0	0	0	0	0	0	0	0	0	1	1	3
4 00	0	0	0	0	0	0	0	0	0	0	1	1	3
4 25	0	0	0	0	0	0	0	0	0	0	1	1	3
4 50	0	0	0	0	0	0	0	0	0	0	1	1	3
4 75	0	0	0	15	0	0	0	0	0	1	1	1	3
5 00	0	0	0	15	0	0	0	0	0	0	1	1	3
5 25	2	0	0	15	0	0	0	0	0	0	1	1	3
5 50	1	0	0	15	0	0	0	0	0	0	1	1	3
5 75	0	20	0	15	0	0	0	0	0	0	1	1	3
6 00	0	20	0	15	0	0	0	0	0	0	1	1	3
6 25	32	20	0	15	0	0	0	0	0	0	1	1	3
6 50	75	20	0	15	0	0	0	0	0	0	1	1	3
6 75	69	20	0	15	0	0	0	0	0	0	1	1	3
7 00	17	20	0	15	0	0	0	0	0	0	1	1	3
7 25	15	20	0	15	0	0	0	0	0	0	1	1	3
7 50	82	20	0	15	0	0	0	0	0	0	1	1	3
7 75	105	20	0	15	0	0	0	0	0	1	1	1	3
8 00	110	40	0	15	0	0	0	0	0	0	1	1	3
8 25	25	40	0	15	0	0	0	0	0	0	1	1	3
8 50	68	40	0	15	0	0	0	0	0	0	1	1	3
8 75	46	40	0	15	0	0	0	0	0	0	1	1	3
9 00	120	40	0	15	0	0	0	0	0	1	1	1	3
9 25	214	40	0	15	1	0	0	0	0	0	1	1	3
9 50	246	40	0	15	1	1	0	0	0	0	1	1	3
9 75	256	40	0	15	0	1	0	0	0	0	1	1	3
10 00	361	40	0	15	1	1	0	0	0	0	1	1	3
10 25	204	40	0	15	1	1	0	0	0	0	1	1	3
10 50	88	40	0	15	0	0	0	0	0	1	1	1	3
10 75	307	40	0	15	0	0	0	0	0	0	1	1	3
11 00	246	40	0	15	0	0	0	0	0	0	1	1	3
11 25	77	40	0	15	0	0	0	0	0	0	1	1	3
11 50	22	40	0	15	0	0	0	0	0	0	1	1	3
11 75	51	40	0	15	0	0	0	0	0	0	1	1	3
12 00	16	40	0	15	0	0	0	0	0	0	1	1	3
12 25	7	40	0	15	0	0	0	0	0	0	1	1	3

UCSF1 TEAM 1, FEMALE-70, ORIENTAL, POOR CONE FIT, REMOVE MANDIBULAR CANINE

TIME MIN	CONC PPM	N2O %	PULL POKE	PROBE DIST.	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	MASK TYPE	DENT TEAM	OPER
12 50	6	40	0	15	0	0	0	0	0	0	1	1	3
12 75	47	40	0	15	0	0	0	0	0	0	1	1	3
13 00	106	40	0	15	0	0	0	0	0	0	1	1	3
13 25	57	40	0	15	0	0	0	0	0	0	1	1	3
13 50	13	40	0	15	0	0	0	0	0	0	1	1	3
13 75	1	40	0	15	0	0	0	0	0	0	1	1	3
14 00	91	40	0	15	0	0	0	0	0	0	1	1	3
14 25	140	40	0	15	0	0	0	0	0	0	1	1	3
14 50	165	40	0	15	1	0	0	0	0	0	1	1	3
14 75	281	40	0	15	1	0	0	1	0	0	1	1	3
15 00	147	40	0	15	1	0	0	0	0	0	1	1	3
15 25	204	40	0	15	1	0	0	0	0	0	1	1	3
15 50	152	40	0	15	1	1	0	0	0	0	1	1	3
15 75	125	40	0	15	0	1	1	0	0	1	1	1	3
16 00	186	40	1	15	0	1	0	0	0	0	1	1	3
16 25	252	40	1	15	0	1	0	0	0	0	1	1	3
16 50	240	40	1	15	0	1	0	0	0	0	1	1	3
16 75	155	40	1	15	0	1	0	0	0	0	1	1	3
17 00	59	40	1	15	0	1	0	0	0	0	1	1	3
17 25	47	40	1	15	0	1	0	0	0	0	1	1	3
17 50	95	40	1	15	0	1	0	0	0	0	1	1	3
17 75	43	40	1	15	0	1	0	0	0	0	1	1	3
18 00	59	40	1	15	0	1	0	0	0	0	1	1	3
18 25	141	40	1	15	0	1	0	0	0	0	1	1	3
18 50	83	40	1	15	0	1	0	0	0	0	1	1	3
18 75	138	40	1	15	0	1	0	0	0	0	1	1	3
19 00	234	40	1	15	0	1	0	0	0	0	1	1	3
19 25	143	40	1	15	0	1	0	0	0	0	1	1	3
19 50	82	40	1	15	0	1	0	0	0	0	1	1	3
19 75	46	40	1	15	0	1	0	0	0	0	1	1	3
20 00	20	40	1	15	0	1	0	0	0	0	1	1	3
20 25	107	40	0	15	0	1	0	0	0	1	1	1	3
20 50	102	40	0	15	0	0	0	0	0	1	1	1	3
20 75	102	40	0	15	0	0	0	0	0	1	1	1	3
21 00	149	40	0	15	0	0	0	0	0	1	1	1	3
21 25	114	40	0	15	0	0	0	0	0	1	1	1	3
21 50	67	40	0	15	0	0	0	0	0	1	1	1	3
21 75	32	40	0	15	0	0	0	0	0	1	1	1	3
22 00	51	40	0	15	0	0	0	0	0	1	1	1	3
22 25	93	40	0	15	0	0	0	0	0	1	1	1	3
22 50	73	40	0	15	0	0	0	0	0	1	1	1	3
22 75	230	40	0	15	0	0	0	0	0	1	1	1	3
23 00	266	40	0	15	0	0	0	0	0	1	1	1	3
23 25	176	40	0	15	0	0	0	0	0	1	1	1	3
23 50	95	40	0	15	0	0	0	0	0	1	1	1	3
23 75	97	40	0	15	0	1	0	0	0	1	1	1	3
24 00	33	40	0	15	0	0	0	0	0	0	1	1	3
24 25	88	40	0	15	0	0	0	0	0	0	1	1	3
24 50	133	0	0	15	0	0	0	0	0	0	1	1	3
24 75	134	0	0	15	0	0	0	0	0	0	1	1	3

UCSF1 TEAM 1, FEMALE-70, ORIENTAL, POOR CONE FIT, REMOVE MANDIBULAR CANINE

TIME	CONC	N2O	PULL	PROBE				PATIENT			MASK	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	TYPE	TEAM	OPER
25 00	40	0	0	15	0	0	0	0	0	0	1	1	3
25 25	16	0	0	15	0	0	0	0	0	0	1	1	3
25 50	10	0	0	15	0	0	0	0	0	0	1	1	3
25 75	8	0	0	15	0	0	0	0	0	0	1	1	3
26 00	10	0	0	15	0	0	0	0	0	0	1	1	3
26 25	9	0	0	15	0	0	0	0	0	0	1	1	3
26 50	6	0	0	15	0	0	0	0	0	0	1	1	3
26 75	3	0	0	15	0	0	0	0	0	0	1	1	3
27 00	2	0	0	15	0	0	0	0	0	0	1	1	3
27 25	2	0	0	15	0	0	0	0	0	0	1	1	3
27 50	1	0	0	15	0	0	0	1	0	0	1	1	3
27 75	1	0	0	15	0	0	0	0	0	0	1	1	3
28 00	0	0	0	15	0	0	0	0	0	0	1	1	3
28 25	0	0	0	15	0	0	0	0	0	0	1	1	3
28 50	0	0	0	15	0	0	0	0	0	0	1	1	3
28 75	0	0	0	15	0	0	0	0	0	0	1	1	3
29 00	0	0	0	15	0	0	0	0	0	0	1	1	3
29 25	0	0	0	15	0	0	0	0	0	0	1	1	3
29 50	5	0	0	15	0	0	0	0	0	1	1	1	3
29 75	1	0	0	15	0	0	0	0	0	0	1	1	3
30 00	1	0	0	15	0	0	0	0	0	0	1	1	3
30 25	0	0	0	15	0	0	0	0	0	0	1	1	3
30 50	0	0	0	15	0	0	0	0	0	0	1	1	3
30 75	0	0	0	15	0	0	0	0	0	0	1	1	3
31 00	0	0	0	15	0	0	0	0	0	0	1	1	3
31 25	0	0	0	15	0	0	0	0	0	0	1	1	3
31 50	0	0	0	15	0	0	0	0	0	0	1	1	3
31 75	0	0	0	15	0	0	0	0	0	0	1	1	3
32 00	0	0	0	15	0	0	0	0	0	0	1	1	3
32 25	0	0	0	15	0	0	0	0	0	0	1	1	3
32 50	0	0	0	15	0	0	0	0	0	0	1	1	3

UCSF2 TEAM 1, MALE-24, POOR CONE FIT, SUCTION OFF-FST 3MIN, R-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			MASK	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	TYPE	TEAM	OPER
0 25	1	0	0	12	0	0	0	0	0	0	1	1	1
0 50	0	0	0	12	0	0	0	0	0	0	1	1	1
0 75	0	0	0	12	0	0	0	0	0	0	1	1	1
1 00	0	20	0	12	0	0	0	0	0	0	1	1	1
1 25	11	20	0	12	0	0	0	0	0	0	1	1	1
1 50	233	20	0	12	0	0	0	0	0	0	1	1	1
1 75	218	20	0	12	0	0	0	0	0	1	1	1	1
2 00	215	40	0	12	0	0	0	0	0	0	1	1	1
2 25	334	40	0	12	0	0	0	0	0	0	1	1	1
2 50	192	40	0	12	0	0	0	0	0	1	1	1	1
2 75	206	40	0	12	0	0	0	0	0	0	1	1	1
3 00	132	40	0	12	0	0	0	0	0	1	1	1	1
3 25	111	40	0	12	0	0	0	1	0	0	1	1	1
3 50	482	40	0	12	0	0	0	0	0	0	1	1	1
3 75	794	40	0	12	0	0	0	0	0	1	1	1	1
4 00	401	40	0	12	0	0	0	0	0	0	1	1	1
4 25	313	40	0	12	0	0	0	0	0	0	1	1	1
4 50	158	40	0	12	0	0	0	0	0	0	1	1	1
4 75	171	40	0	12	0	0	0	0	0	0	1	1	1
5 00	63	40	0	12	0	0	0	0	0	0	1	1	1
5 25	150	40	0	12	0	0	0	0	0	0	1	1	1
5 50	275	40	0	12	0	0	0	0	0	0	1	1	1
5 75	345	40	0	12	0	0	0	0	0	0	1	1	1
6 00	156	40	0	12	0	0	0	0	0	0	1	1	1
6 25	113	40	0	12	0	0	0	0	0	0	1	1	1
6 50	324	40	0	12	0	0	0	1	0	1	1	1	1
6 75	583	40	0	12	0	0	0	0	0	0	1	1	1
7 00	272	40	0	12	0	0	0	0	0	1	1	1	1
7 25	118	40	0	12	0	0	0	0	0	0	1	1	1
7 50	85	40	0	12	0	0	0	0	0	0	1	1	1
7 75	98	40	0	12	0	0	0	0	0	0	1	1	1
8 00	41	40	0	12	0	0	0	0	0	0	1	1	1
8 25	53	40	0	12	0	0	0	0	0	1	1	1	1
8 50	188	40	0	12	0	0	0	0	0	0	1	1	1
8 75	62	40	0	12	0	0	0	0	0	0	1	1	1
9 00	103	40	0	12	0	0	0	0	0	0	1	1	1
9 25	83	40	0	12	0	0	0	0	0	0	1	1	1
9 50	72	40	0	12	0	0	0	0	0	0	1	1	1
9 75	307	40	0	12	0	0	0	0	0	0	1	1	1
10 00	207	40	0	12	0	0	0	0	0	0	1	1	1
10 25	80	40	0	12	0	0	0	0	0	0	1	1	1
10 50	53	40	0	12	0	0	0	0	0	0	1	1	1
10 75	106	40	0	12	0	0	0	0	0	0	1	1	1
11 00	187	40	0	12	0	0	0	0	0	1	1	1	1
11 25	165	40	0	12	0	0	0	0	0	0	1	1	1
11 50	184	40	0	12	1	1	0	0	0	0	1	1	1
11 75	149	40	0	12	0	1	0	0	0	0	1	1	1
12 00	248	40	0	12	1	0	0	0	0	0	1	1	1
12 25	229	40	0	12	0	1	0	0	0	0	1	1	1
12 50	149	40	0	12	1	0	0	0	0	0	1	1	1

UCSF2 TEAM 1, MALE-24, POOR CONE FIT, SUCTION OFF-FST 3MIN, R-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			MASK	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	TYPE	TEAM	OPER
12 75	221	40	0	12	1	0	0	0	0	0	1	1	1
13 00	98	40	0	12	1	0	0	0	0	0	1	1	1
13 25	97	40	0	12	0	1	0	0	0	0	1	1	1
13 50	73	40	0	12	1	0	0	0	0	0	1	1	1
13 75	153	40	0	12	1	0	0	0	0	0	1	1	1
14 00	182	40	0	12	1	0	0	0	0	0	1	1	1
14 25	142	40	0	12	0	0	0	0	0	0	1	1	1
14 50	115	40	0	12	0	0	0	0	0	0	1	1	1
14 75	100	40	0	12	0	0	0	0	0	0	1	1	1
15 00	115	40	0	12	1	1	0	0	0	0	1	1	1
15 25	124	40	0	12	0	0	0	0	0	0	1	1	1
15 50	126	40	0	12	0	0	0	0	0	0	1	1	1
15 75	143	40	0	12	0	0	0	0	0	0	1	1	1
16 00	174	40	1	12	0	1	0	0	0	0	1	1	1
16 25	90	40	1	12	0	0	0	0	0	0	1	1	1
16 50	125	40	1	12	0	0	0	0	0	0	1	1	1
16 75	74	40	1	12	0	1	0	0	0	0	1	1	1
17 00	72	40	1	12	0	0	0	0	0	0	1	1	1
17 25	84	40	0	12	0	1	0	0	0	0	1	1	1
17 50	67	40	0	12	0	1	0	0	0	0	1	1	1
17 75	43	40	0	12	0	0	1	0	0	0	1	1	1
18 00	81	40	0	12	0	0	0	0	0	0	1	1	1
18 25	53	40	1	12	0	0	0	0	0	0	1	1	1
18 50	162	40	1	12	0	0	0	0	0	0	1	1	1
18 75	71	40	1	12	0	0	0	0	0	0	1	1	1
19 00	125	40	1	12	0	0	0	0	0	0	1	1	1
19 25	118	40	1	12	0	0	0	0	0	0	1	1	1
19 50	178	40	1	12	0	0	0	0	0	0	1	1	1
19 75	106	40	0	12	0	1	0	0	0	1	1	1	1
20 00	90	40	1	12	0	1	0	0	0	0	1	1	1
20 25	87	40	1	12	0	0	0	0	0	0	1	1	1
20 50	66	40	0	12	0	1	1	0	0	0	1	1	1
20 75	60	40	0	12	0	1	0	0	0	0	1	1	1
21 00	39	40	0	12	0	1	0	0	0	0	1	1	1
21 25	139	40	0	12	0	0	0	0	0	0	1	1	1
21 50	161	40	1	12	0	1	0	0	0	0	1	1	1
21 75	130	40	1	12	0	1	0	0	0	0	1	1	1
22 00	156	40	1	12	0	0	0	0	0	0	1	1	1
22 25	165	40	1	12	0	0	0	0	0	0	1	1	1
22 50	106	40	1	12	0	0	0	0	0	0	1	1	1
22 75	44	40	0	12	0	0	0	0	0	0	1	1	1
23 00	27	40	0	12	0	1	1	0	0	0	1	1	1
23 25	29	40	0	12	0	1	0	0	0	0	1	1	1
23 50	74	40	1	12	0	1	0	0	0	0	1	1	1
23 75	121	40	1	12	0	0	0	0	0	0	1	1	1
24 00	67	40	1	12	0	0	0	0	0	0	1	1	1
24 25	153	40	1	12	0	0	0	0	0	0	1	1	1
24 50	174	40	1	12	0	0	0	0	0	0	1	1	1
24 75	108	40	1	12	0	0	0	0	0	0	1	1	1
25 00	94	40	1	12	0	0	0	0	0	0	1	1	1

UCSF2 TEAM 1, MALE-24, POOR CONE FIT, SUCTION OFF-FST 3MIN, R-4 WISDOM TEETH

TIME MIN	CONC PPM	N2O %	PULL POKE	PROBE DIST.	PATIENT						MASK TYPE	DENT TEAM	OPER
					INJECT	ASPIR	WATER	TALKING	DRILL	OTHER			
25 25	90	40	1	12	0	0	0	0	0	0	1	1	1
25 50	164	40	1	12	0	0	0	0	0	0	1	1	1
25 75	114	40	1	12	0	0	0	0	0	0	1	1	1
26 00	110	40	1	12	0	0	0	0	0	0	1	1	1
26 25	71	40	1	12	0	0	0	0	0	0	1	1	1
26 50	43	40	1	12	0	0	0	0	0	0	1	1	1
26 75	31	40	1	12	0	0	0	0	0	0	1	1	1
27 00	49	40	0	12	0	0	0	0	0	0	1	1	1
27 25	51	40	0	12	0	0	0	0	0	0	1	1	1
27 50	67	40	0	12	0	0	0	0	0	0	1	1	1
27 75	14	40	0	12	0	0	0	0	0	0	1	1	1
28 00	15	40	0	12	0	1	1	0	1	0	1	1	1
28 25	69	40	1	12	0	0	0	0	0	0	1	1	1
28 50	91	40	1	12	0	0	0	0	0	0	1	1	1
28 75	81	40	0	12	0	0	0	0	1	0	1	1	1
29 00	204	40	0	12	0	0	0	0	1	0	1	1	1
29 25	89	40	0	12	0	1	1	0	1	0	1	1	1
29 50	35	40	0	12	0	1	1	0	1	0	1	1	1
29 75	122	40	0	12	0	1	1	0	1	0	1	1	1
30 00	90	40	0	12	0	1	1	0	1	0	1	1	1
30 25	53	40	1	12	0	1	0	0	0	0	1	1	1
30 50	129	40	1	12	0	1	0	0	0	0	1	1	1
30 75	96	40	1	12	0	1	0	0	0	0	1	1	1
31 00	25	40	1	12	0	1	1	0	0	0	1	1	1
31 25	67	40	1	12	0	1	0	0	0	0	1	1	1
31 50	84	40	1	12	0	1	0	0	0	0	1	1	1
31 75	84	40	1	12	0	0	0	0	0	0	1	1	1
32 00	88	40	1	12	0	0	1	0	0	0	1	1	1
32 25	16	0	0	12	0	0	0	0	0	0	1	1	1
32 50	7	0	0	12	0	1	1	0	0	0	1	1	1
32 75	25	0	0	12	0	0	0	0	0	1	1	1	1
33 00	18	0	0	12	0	0	0	0	0	1	1	1	1
33 25	3	0	0	12	0	0	0	0	0	1	1	1	1
33 50	10	0	0	12	0	0	0	0	0	1	1	1	1
33 75	16	0	0	12	0	0	0	0	0	1	1	1	1
34 00	14	0	0	12	0	0	0	0	0	1	1	1	1
34 25	13	0	0	12	0	0	0	0	0	1	1	1	1
34 50	6	0	0	12	0	0	0	0	0	1	1	1	1
34 75	1	0	0	12	0	0	0	0	0	1	1	1	1
35 00	1	0	0	12	0	0	0	0	0	1	1	1	1
35 25	0	0	0	12	0	0	0	0	0	1	1	1	1
35 50	0	0	0	12	0	0	0	0	0	1	1	1	1
35 75	0	0	0	12	0	0	0	0	0	1	1	1	1
36 00	3	0	0	12	0	0	0	0	0	1	1	1	1
36 25	0	0	0	12	0	0	0	0	0	1	1	1	1
36 50	0	0	0	12	0	0	0	0	0	1	1	1	1
36 75	0	0	0	12	0	0	0	0	0	1	1	1	1
37 00	0	0	0	12	0	1	0	0	0	1	1	1	1
37 25	0	0	0	12	0	0	0	0	0	1	1	1	1
37 50	0	0	0	12	0	1	0	0	0	1	1	1	1

UCSF2 TEAM 1, MALE-24, POOR CONE FIT, SUCTION OFF-FST 3MIN, R-4 WISDOM TEETH

TIME MIN	CONC PPM	N2O %	PULL POKE	PROBE DIST.	PATIENT						MASK TYPE	DENT TEAM	OPER
					INJECT	ASPIR	WATER	TALKING	DRILL	OTHER			
37 75	0	0	0	12	0	0	0	0	0	1	1	1	1
38 00	0	0	0	12	0	0	0	0	0	1	1	1	1
38 25	1	0	0	12	0	0	0	0	0	1	1	1	1
38 50	13	0	0	12	0	0	0	0	0	1	1	1	1
38 75	7	0	0	12	0	0	0	0	0	1	1	1	1
39 00	8	0	0	12	0	0	0	0	0	1	1	1	1
39 25	3	0	0	12	0	1	0	0	0	0	1	1	1

UCSF3 TEAM 2, FEMALE-24, REMOVE-4 WISDOM TEETH

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST.	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
0 25	181	0	0	12	0	0	0	0	0	0	1	2	1
0 50	74	0	0	12	0	0	0	0	0	0	1	2	1
0 75	23	0	0	12	0	0	0	0	0	0	1	2	1
1 00	2	0	0	12	0	0	0	0	0	0	1	2	1
1 25	2	0	0	12	0	0	0	0	0	0	1	2	1
1 50	2	0	0	12	0	0	0	0	0	0	1	2	1
1 75	1	0	0	12	0	0	0	0	0	0	1	2	1
2 00	0	0	0	12	0	0	0	0	0	0	1	2	1
2 25	1	0	0	12	0	0	0	0	0	0	1	2	1
2 50	0	0	0	12	0	0	0	0	0	0	1	2	1
2 75	0	0	0	12	0	0	0	0	0	0	1	2	1
3 00	0	33	0	12	0	0	0	0	0	1	1	2	1
3 25	3	33	0	12	0	0	0	0	0	0	1	2	1
3 50	91	33	0	12	0	0	0	0	0	0	1	2	1
3 75	82	33	0	12	0	0	0	0	0	0	1	2	1
4 00	59	33	0	12	0	0	0	0	0	0	1	2	1
4 25	91	33	0	12	0	0	0	0	0	0	1	2	1
4 50	112	33	0	12	0	0	0	0	0	0	1	2	1
4 75	99	33	0	12	0	0	0	0	0	0	1	2	1
5 00	65	33	0	12	0	0	0	0	0	0	1	2	1
5 25	30	33	0	12	0	0	0	0	0	0	1	2	1
5 50	96	33	0	12	0	0	0	0	0	0	1	2	1
5 75	28	33	0	12	0	0	0	0	0	0	1	2	1
6 00	44	33	0	12	0	0	0	0	0	0	1	2	1
6 25	50	33	0	12	0	0	0	0	0	0	1	2	1
6 50	87	33	0	12	0	0	0	0	0	0	1	2	1
6 75	40	33	0	12	0	0	0	0	0	0	1	2	1
7 00	48	50	0	12	0	0	0	0	0	0	1	2	1
7 25	22	50	0	12	0	0	0	0	0	0	1	2	1
7 50	177	50	0	12	0	0	0	0	0	0	1	2	1
7 75	171	50	0	12	0	0	0	0	0	0	1	2	1
8 00	112	50	0	12	0	0	0	0	0	0	1	2	1
8 25	68	50	0	12	0	0	0	0	0	0	1	2	1
8 50	93	50	0	12	0	0	0	0	0	0	1	2	1
8 75	54	50	0	12	0	0	0	0	0	0	1	2	1
9 00	83	50	0	12	0	0	0	0	0	0	1	2	1
9 25	119	50	0	12	0	0	0	1	0	0	1	2	1
9 50	68	50	0	12	0	0	0	0	0	0	1	2	1
9 75	109	50	0	12	0	0	0	0	0	0	1	2	1
10 00	60	50	0	12	0	0	0	1	0	0	1	2	1
10 25	45	50	0	12	0	0	0	0	0	0	1	2	1
10 50	74	50	0	12	0	0	0	0	0	0	1	2	1
10 75	77	50	0	12	0	0	0	0	0	0	1	2	1
11 00	96	50	0	12	0	0	0	0	0	0	1	2	1
11 25	90	50	0	12	0	0	0	1	0	0	1	2	1
11 50	13	50	0	12	0	0	0	0	0	0	1	2	1
11 75	41	50	0	12	0	0	0	0	0	0	1	2	1
12 00	183	50	0	12	0	0	0	0	0	0	1	2	1
12 25	79	50	0	12	0	0	0	0	0	0	1	2	1
12 50	45	50	0	12	0	0	0	0	0	0	1	2	1

UCSF3 TEAM 2, FEMALE-24, REMOVE-4 WISDOM TEETH

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST.	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
12 75	59	50	0	12	0	0	0	0	0	0	1	2	1
13 00	102	50	0	12	1	0	0	0	0	0	1	2	1
13 25	136	50	0	12	1	0	0	0	0	0	1	2	1
13 50	34	50	0	12	1	0	0	0	0	0	1	2	1
13 75	12	50	0	12	0	0	0	0	0	0	1	2	1
14 00	14	50	0	12	0	0	0	0	0	0	1	2	1
14 25	2	50	0	12	0	0	0	0	0	0	1	2	1
14 50	0	50	0	12	1	0	0	0	0	0	1	2	1
14 75	9	50	0	12	1	0	0	0	0	0	1	2	1
15 00	43	50	0	12	1	0	0	0	0	0	1	2	1
15 25	11	50	0	12	1	0	0	0	0	0	1	2	1
15 50	60	50	0	12	1	0	0	0	0	0	1	2	1
15 75	187	50	0	12	1	0	0	0	0	0	1	2	1
16 00	112	50	0	12	1	0	0	0	0	0	1	2	1
16 25	37	50	0	12	1	0	0	0	0	0	1	2	1
16 50	59	50	0	12	1	0	0	0	0	0	1	2	1
16 75	27	50	0	12	1	0	0	0	0	0	1	2	1
17 00	41	50	0	12	0	0	0	0	0	0	1	2	1
17 25	89	50	0	12	0	0	0	0	0	0	1	2	1
17 50	125	50	0	12	0	0	0	0	0	0	1	2	1
17 75	18	50	0	12	0	0	0	0	0	0	1	2	1
18 00	64	50	0	12	0	0	0	0	0	0	1	2	1
18 25	65	50	0	12	0	0	0	0	0	0	1	2	1
18 50	5	50	0	12	0	0	0	0	0	0	1	2	1
18 75	0	50	0	12	0	0	0	1	0	0	1	2	1
19 00	45	50	0	12	0	1	0	0	0	0	1	2	1
19 25	133	50	0	12	0	1	0	0	0	0	1	2	1
19 50	45	50	0	12	0	1	0	0	0	0	1	2	1
19 75	5	50	1	12	0	1	0	0	0	0	1	2	1
20 00	13	50	1	12	0	1	0	1	0	0	1	2	1
20 25	49	50	1	12	0	1	0	0	0	0	1	2	1
20 50	320	50	1	12	0	1	0	1	0	0	1	2	1
20 75	262	50	0	12	0	1	0	0	1	0	1	2	1
21 00	143	50	0	12	0	1	0	0	1	0	1	2	1
21 25	401	50	0	12	0	1	0	0	1	0	1	2	1
21 50	352	50	0	12	0	1	1	0	1	0	1	2	1
21 75	254	50	0	12	0	1	1	0	0	0	1	2	1
22 00	185	50	0	12	0	1	1	0	1	1	1	2	1
22 25	294	50	0	12	0	1	1	0	1	0	1	2	1
22 50	162	50	0	12	0	1	1	0	1	0	1	2	1
22 75	170	50	0	12	0	1	1	0	1	0	1	2	1
23 00	107	50	0	12	0	1	1	1	1	0	1	2	1
23 25	162	50	0	12	0	1	1	1	1	0	1	2	1
23 50	272	50	0	12	0	1	1	0	1	0	1	2	1
23 75	209	50	0	12	0	1	1	0	1	0	1	2	1
24 00	70	50	1	12	0	1	1	0	1	1	1	2	1
24 25	72	50	1	12	0	1	0	0	0	1	1	2	1
24 50	125	50	1	12	0	1	0	0	0	0	1	2	1
24 75	58	50	1	12	0	1	0	0	0	0	1	2	1
25 00	18	50	1	12	0	1	0	0	0	0	1	2	1

UCSF3 TEAM 2, FEMALE-24, REMOVE-4 WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST.	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
25 25	13	50	1	12	0	1	0	0	0	0	1	2	1
25 50	2	50	1	12	0	1	0	0	0	0	1	2	1
25 75	0	50	0	12	0	1	1	0	1	0	1	2	1
26 00	0	50	0	12	0	1	1	0	1	0	1	2	1
26 25	0	50	0	12	0	1	1	0	1	0	1	2	1
26 50	0	50	0	12	0	1	0	0	0	0	1	2	1
26 75	25	50	0	12	0	1	0	0	0	0	1	2	1
27 00	17	50	0	12	0	1	0	0	0	1	1	2	1
27 25	10	50	0	12	0	0	0	0	0	1	1	2	1
27 50	87	50	0	12	0	0	0	0	0	1	1	2	1
27 75	105	50	0	12	0	0	0	0	0	1	1	2	1
28 00	55	50	0	12	0	0	0	0	0	1	1	2	1
28 25	100	50	0	12	0	0	0	0	0	1	1	2	1
28 50	156	50	0	12	0	0	0	0	0	0	1	2	1
28 75	62	50	1	12	0	0	0	0	0	0	1	2	1
29 00	11	50	1	12	0	0	0	0	0	1	1	2	1
29 25	1	50	1	12	0	0	0	0	0	0	1	2	1
29 50	12	50	0	12	0	0	0	0	0	1	1	2	1
29 75	50	50	0	12	0	0	0	0	0	1	1	2	1
30 00	134	50	0	12	0	0	0	0	0	1	1	2	1
30 25	166	50	0	12	0	0	0	0	0	1	1	2	1
30 50	195	50	0	12	0	0	0	0	0	1	1	2	1
30 75	153	50	1	12	0	0	0	0	0	0	1	2	1
31 00	385	50	1	12	0	0	0	0	0	0	1	2	1
31 25	631	50	1	12	0	0	0	0	0	0	1	2	1
31 50	344	50	0	12	0	0	0	0	0	0	1	2	1
31 75	309	50	0	12	0	0	0	0	0	1	1	2	1
32 00	383	50	0	12	0	0	0	0	0	1	1	2	1
32 25	137	50	0	12	0	0	0	0	0	1	1	2	1
32 50	230	50	0	12	0	0	0	0	0	1	1	2	1
32 75	339	50	1	12	0	0	0	0	0	0	1	2	1
33 00	419	50	1	12	0	0	0	0	0	0	1	2	1
33 25	190	50	0	12	0	1	1	0	1	0	1	2	1
33 50	112	50	0	12	0	1	1	0	1	0	1	2	1
33 75	518	50	0	12	0	1	1	0	1	0	1	2	1
34 00	969	50	0	12	0	1	1	0	1	0	1	2	1
34 25	1671	50	0	12	0	1	1	0	1	0	1	2	1
34 50	1455	50	0	12	0	1	1	0	1	0	1	2	1
34 75	628	50	0	12	0	1	1	0	1	0	1	2	1
35 00	258	50	0	12	0	1	1	0	1	0	1	2	1
35 25	170	50	0	12	0	1	1	0	1	0	1	2	1
35 50	151	50	0	12	0	1	1	0	1	0	1	2	1
35 75	82	50	1	12	0	1	0	0	0	0	1	2	1
36 00	33	50	1	12	0	0	0	0	0	0	1	2	1
36 25	227	50	1	12	0	0	0	0	0	0	1	2	1
36 50	417	50	1	12	0	0	0	0	0	0	1	2	1
36 75	179	50	1	12	0	0	0	0	0	0	1	2	1
37 00	415	50	1	12	0	1	1	0	1	0	1	2	1
37 25	941	50	0	12	0	0	0	0	1	0	1	2	1
37 50	746	50	0	12	0	0	0	0	0	0	1	2	1

UCSF3 TEAM 2, FEMALE-24, REMOVE-4 WISDOM TEETH

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
37 75	477	50	1	12	0	0	0	0	0	0	1	2	1
38 00	379	50	0	12	0	1	1	0	0	0	1	2	1
38 25	379	50	0	12	0	1	1	0	0	0	1	2	1
38 50	282	50	0	12	0	1	1	0	0	0	1	2	1
38 75	319	50	0	12	0	0	0	0	0	0	1	2	1
39 00	456	50	0	12	0	0	0	0	0	1	1	2	1
39 25	302	50	0	12	0	0	0	0	0	1	1	2	1
39 50	455	50	0	12	0	0	0	0	0	0	1	2	1
39 75	296	50	0	12	0	0	0	0	0	0	1	2	1
40 00	334	0	0	12	0	0	0	0	0	0	1	2	1
40 25	348	0	0	12	0	0	0	0	0	1	1	2	1
40 50	298	0	0	12	0	0	0	0	0	1	1	2	1
40 75	140	0	0	12	0	0	0	0	0	0	1	2	1
41 00	195	0	0	12	0	0	0	0	0	0	1	2	1
41 25	133	0	0	12	0	0	0	0	0	0	1	2	1
41 50	157	0	0	12	0	0	0	0	0	0	1	2	1
41 75	127	0	0	12	0	0	0	0	0	0	1	2	1
42 00	81	0	0	12	0	0	0	0	0	0	1	2	1
42 25	128	0	0	12	0	0	0	0	0	0	1	2	1
42 50	117	0	0	12	0	0	0	0	0	0	1	2	1
42 75	90	0	0	12	0	0	0	0	0	0	1	2	1
43 00	83	0	0	12	0	0	0	0	0	0	1	2	1
43 25	52	0	0	12	0	0	0	0	0	0	1	2	1
43 50	39	0	0	12	0	0	0	0	0	0	1	2	1
43 75	61	0	0	12	0	0	0	0	0	0	1	2	1
44 00	35	0	0	12	0	0	0	0	0	0	1	2	1
44 25	5	0	0	12	0	0	0	0	0	0	1	2	1
44 50	39	0	0	12	0	0	0	0	0	0	1	2	1
44 75	34	0	0	12	0	0	0	0	0	0	1	2	1
45 00	93	0	0	12	0	0	0	0	0	0	1	2	1
45 25	76	0	0	12	0	0	0	0	0	0	1	2	1
45 50	43	0	0	12	0	0	0	0	0	0	1	2	1
45 75	33	0	0	12	0	0	0	0	0	0	1	2	1
46 00	43	0	0	12	0	0	0	0	0	0	1	2	1
46 25	29	0	0	12	0	0	0	0	0	0	1	2	1
46 50	6	0	0	12	0	0	0	0	0	0	1	2	1
46 75	12	0	0	12	0	0	0	0	0	0	1	2	1
47 00	4	0	0	12	0	0	0	0	0	0	1	2	1
47 25	3	0	0	12	0	0	0	0	0	0	1	2	1
47 50	10	0	0	12	0	0	0	0	0	0	1	2	1
47 75	9	0	0	12	0	0	0	0	0	0	1	2	1
48 00	20	0	0	12	0	0	0	0	0	0	1	2	1
48 25	8	0	0	12	0	0	0	0	0	0	1	2	1
48 50	3	0	0	12	0	0	0	0	0	0	1	2	1
48 75	8	0	0	12	0	0	0	0	0	0	1	2	1
49 00	13	0	0	12	0	0	0	0	0	0	1	2	1
49 25	39	0	0	12	0	0	0	0	0	0	1	2	1
49 50	31	0	0	12	0	0	0	0	0	0	1	2	1
49 75	10	0	0	12	0	0	0	0	0	0	1	2	1
50 00	5	0	0	12	0	0	0	0	0	0	1	2	1

UCSF3 TEAM 2, FEMALE-24, REMOVE-4 WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	PATIENT						TYPE MASK	DENT TEAM	OPER
					INJECT	ASPIR	WATER	TALKING	DRILL	OTHER			
50 25	19	0	0	12	0	0	0	0	0	0	1	2	1
50 50	17	0	0	12	0	0	0	0	0	0	1	2	1
50 75	11	0	0	12	0	0	0	0	0	0	1	2	1
51 00	3	0	0	12	0	0	0	0	0	0	1	2	1
51 25	0	0	0	12	0	0	0	0	0	0	1	2	1
51 50	8	0	0	12	0	0	0	0	0	0	1	2	1
51 75	3	0	0	12	0	0	0	0	0	0	1	2	1
52 00	2	0	0	12	0	0	0	0	0	0	1	2	1
52 25	9	0	0	12	0	0	0	0	0	0	1	2	1

UCSF4 TEAM 3, FEMALE-38, PROBE MOVEMENT, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST.	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
0 25	0	0	0	15	0	0	0	0	0	0	1	3	1
0 50	0	0	0	15	0	0	0	0	0	0	1	3	1
0 75	0	0	0	15	0	0	0	0	0	0	1	3	1
1 00	0	0	0	15	0	0	0	0	0	0	1	3	1
1 25	0	0	0	15	0	0	0	0	0	0	1	3	1
1 50	0	0	0	15	0	0	0	0	0	0	1	3	1
1 75	0	0	0	15	0	0	0	0	0	0	1	3	1
2 00	0	0	0	15	0	0	0	0	0	0	1	3	1
2 25	0	0	0	15	0	0	0	0	0	0	1	3	1
2 50	0	0	0	15	0	0	0	0	0	0	1	3	1
2 75	0	0	0	15	0	0	0	0	0	0	1	3	1
3 00	0	0	0	15	0	0	0	0	0	0	1	3	1
3 25	0	0	0	15	0	0	0	0	0	0	1	3	1
3 50	0	0	0	15	0	0	0	0	0	0	1	3	1
3 75	0	0	0	15	0	0	0	0	0	0	1	3	1
4 00	0	0	0	15	0	0	0	0	0	0	1	3	1
4 25	0	0	0	15	0	0	0	0	0	0	1	3	1
4 50	0	0	0	15	0	0	0	0	0	0	1	3	1
4 75	0	0	0	15	0	0	0	0	0	0	1	3	1
5 00	0	0	0	15	0	0	0	0	0	0	1	3	1
5 25	0	0	0	15	0	0	0	0	0	0	1	3	1
5 50	0	30	0	15	0	0	0	0	0	0	1	3	1
5 75	0	30	0	15	0	0	0	0	0	0	1	3	1
6 00	0	30	0	15	0	0	0	0	0	0	1	3	1
6 25	0	30	0	15	0	0	0	0	0	0	1	3	1
6 50	0	30	0	13	0	0	0	0	0	0	1	3	1
6 75	0	30	0	13	0	0	0	0	0	0	1	3	1
7 00	1	30	0	13	0	0	0	0	0	0	1	3	1
7 25	24	30	0	13	0	0	0	0	0	0	1	3	1
7 50	11	30	0	13	0	0	0	0	0	0	1	3	1
7 75	2	30	0	13	0	0	0	0	0	0	1	3	1
8 00	1	30	0	13	0	0	0	0	0	0	1	3	1
8 25	1	30	0	13	0	0	0	0	0	0	1	3	1
8 50	4	30	0	13	0	0	0	0	0	0	1	3	1
8 75	60	30	0	13	0	0	0	0	0	0	1	3	1
9 00	10	30	0	13	0	0	0	0	0	0	1	3	1
9 25	6	30	0	13	0	0	0	0	0	0	1	3	1
9 50	5	30	0	13	0	0	0	0	0	0	1	3	1
9 75	8	30	0	13	0	0	0	0	0	0	1	3	1
10 00	81	30	0	13	0	0	0	0	0	0	1	3	1
10 25	36	30	0	13	0	0	0	1	0	0	1	3	1
10 50	20	30	0	13	0	0	0	0	0	0	1	3	1
10 75	1	30	0	13	0	0	0	0	0	0	1	3	1
11 00	1	30	0	13	0	0	0	0	0	0	1	3	1
11 25	1	30	0	13	0	0	0	0	0	0	1	3	1
11 50	6	30	0	13	0	0	0	0	0	0	1	3	1
11 75	6	30	0	13	0	0	0	0	0	0	1	3	1
12 00	56	30	0	13	0	0	0	0	0	0	1	3	1
12 25	34	30	0	13	0	0	0	1	0	0	1	3	1
12 50	56	30	0	13	0	0	0	0	0	0	1	3	1

UCSF4 TEAM 3, FEMALE-38, PROBE MOVEMENT, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST.	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
12 75	74	30	0	13	0	0	0	0	0	0	1	3	1
13 00	14	30	0	13	0	0	0	1	0	0	1	3	1
13 25	4	30	0	13	0	0	0	1	0	0	1	3	1
13 50	53	30	0	13	0	0	0	0	0	0	1	3	1
13 75	47	30	0	13	0	0	0	0	0	0	1	3	1
14 00	7	30	0	13	0	0	0	0	0	0	1	3	1
14 25	0	30	0	13	0	0	0	0	0	0	1	3	1
14 50	1	30	0	13	0	0	0	1	0	0	1	3	1
14 75	1	30	0	13	0	0	0	0	0	0	1	3	1
15 00	1	30	0	13	0	0	0	0	0	0	1	3	1
15 25	1	30	0	13	0	0	0	0	0	0	1	3	1
15 50	0	30	0	13	0	0	0	0	0	0	1	3	1
15 75	1	30	0	13	1	0	0	1	0	0	1	3	1
16 00	1	30	0	11	1	0	0	0	0	0	1	3	1
16 25	0	30	0	11	1	0	0	0	0	0	1	3	1
16 50	0	30	0	11	1	0	0	0	0	0	1	3	1
16 75	1	30	0	11	1	0	0	0	0	0	1	3	1
17 00	3	30	0	11	1	0	0	0	0	0	1	3	1
17 25	0	30	0	11	1	0	0	0	0	0	1	3	1
17 50	0	30	0	11	1	0	0	0	0	0	1	3	1
17 75	0	30	0	11	0	0	0	0	0	0	1	3	1
18 00	0	30	0	11	1	0	0	0	0	0	1	3	1
18 25	0	30	0	11	0	0	0	0	0	0	1	3	1
18 50	0	30	0	11	0	0	0	0	0	0	1	3	1
18 75	0	30	0	11	1	0	0	0	0	0	1	3	1
19 00	0	30	0	11	1	0	0	0	0	0	1	3	1
19 25	0	30	0	11	0	0	0	0	0	0	1	3	1
19 50	0	30	0	11	0	0	0	0	0	0	1	3	1
19 75	0	30	0	11	0	0	0	0	0	0	1	3	1
20 00	0	30	0	11	0	0	0	0	0	0	1	3	1
20 25	7	30	0	11	0	1	0	0	0	0	1	3	1
20 50	1	30	0	11	0	0	0	0	0	0	1	3	1
20 75	0	30	0	11	0	0	0	0	0	0	1	3	1
21 00	0	0	0	11	0	0	0	0	0	0	1	3	1
21 25	0	0	1	11	0	0	0	0	0	0	1	3	1
21 50	2	0	1	11	0	0	0	0	0	0	1	3	1
21 75	5	0	1	11	0	0	0	0	0	0	1	3	1
22 00	180	0	1	11	0	0	0	0	0	0	1	3	1
22 25	321	0	1	11	0	1	0	0	0	0	1	3	1
22 50	211	0	1	11	0	0	0	0	0	0	1	3	1
22 75	170	0	1	11	0	1	0	0	0	0	1	3	1
23 00	131	0	0	11	0	1	0	0	0	0	1	3	1
23 25	126	0	0	11	0	1	0	0	0	0	1	3	1
23 50	111	0	0	11	0	1	0	0	0	1	1	3	1
23 75	103	0	0	11	0	1	0	0	0	1	1	3	1
24 00	113	0	0	11	0	1	0	0	0	1	1	3	1
24 25	91	0	0	11	0	1	0	0	0	1	1	3	1
24 50	71	0	0	11	0	1	0	0	0	0	1	3	1
24 75	139	0	1	11	0	1	0	0	0	0	1	3	1
25 00	171	0	1	11	0	1	0	0	0	0	1	3	1

UCSF4 TEAM 3, FEMALE-38, PROBE MOVEMENT, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
25 25	164	0	1	11	0	1	0	0	0	0	1	3	1
25 50	156	0	1	11	0	1	1	0	0	0	1	3	1
25 75	306	0	1	11	0	1	1	0	1	0	1	3	1
26 00	219	0	0	11	0	1	1	0	1	0	1	3	1
26 25	231	0	0	11	0	1	1	0	1	0	1	3	1
26 50	228	0	0	11	0	1	1	0	1	0	1	3	1
26 75	199	0	1	11	0	1	1	0	0	0	1	3	1
27 00	233	0	1	11	0	1	0	0	0	0	1	3	1
27 25	187	0	1	11	0	1	0	0	0	0	1	3	1
27 50	138	0	1	11	0	1	0	0	1	0	1	3	1
27 75	130	0	0	11	0	1	0	0	1	0	1	3	1
28 00	212	0	0	11	0	1	0	0	1	0	1	3	1
28 25	154	0	0	11	0	1	0	0	1	0	1	3	1
28 50	203	0	1	11	0	1	0	0	0	0	1	3	1
28 75	162	0	1	11	0	1	0	0	0	0	1	3	1
29 00	103	0	1	11	0	1	0	0	0	0	1	3	1
29 25	136	0	1	11	0	1	0	0	0	0	1	3	1
29 50	139	0	0	11	0	1	1	0	0	0	1	3	1
29 75	117	0	0	11	0	1	1	0	0	0	1	3	1
30 00	101	0	0	11	0	1	0	0	0	1	1	3	1
30 25	70	0	0	11	0	0	0	0	0	1	1	3	1
30 50	142	0	0	11	0	0	0	0	0	1	1	3	1
30 75	158	0	0	11	0	0	0	0	0	1	1	3	1
31 00	118	0	0	11	0	0	0	0	0	1	1	3	1
31 25	96	0	0	11	0	1	0	0	0	1	1	3	1
31 50	111	0	0	11	0	1	0	0	0	1	1	3	1
31 75	84	0	0	11	0	1	1	0	0	0	1	3	1
32 00	114	0	1	11	0	1	0	0	0	0	1	3	1
32 25	118	0	1	11	0	0	0	0	0	0	1	3	1
32 50	100	0	1	11	0	1	0	0	0	0	1	3	1
32 75	95	0	1	11	0	0	0	0	0	0	1	3	1
33 00	68	0	1	11	0	1	0	0	0	0	1	3	1
33 25	50	0	1	11	0	0	0	0	0	0	1	3	1
33 50	41	0	1	11	0	1	0	0	0	0	1	3	1
33 75	97	0	1	11	0	0	0	0	0	0	1	3	1
34 00	69	0	1	11	0	1	0	0	0	0	1	3	1
34 25	18	0	0	11	0	1	0	0	0	0	1	3	1
34 50	9	0	0	11	0	1	0	0	0	0	1	3	1
34 75	42	0	0	11	0	0	0	0	0	1	1	3	1
35 00	31	0	0	11	0	0	0	0	0	1	1	3	1
35 25	68	0	0	11	0	0	0	0	0	1	1	3	1
35 50	85	0	0	11	0	0	0	0	0	1	1	3	1
35 75	67	0	0	11	0	0	0	0	0	1	1	3	1
36 00	62	0	0	11	0	1	0	0	0	1	1	3	1
36 25	54	0	0	11	0	0	0	0	0	1	1	3	1
36 50	59	0	0	11	0	0	0	0	0	1	1	3	1
36 75	76	0	0	11	0	0	0	0	0	1	1	3	1
37 00	33	0	0	11	0	0	0	0	0	1	1	3	1
37 25	11	0	0	11	0	1	0	0	0	1	1	3	1
37 50	6	0	0	11	0	0	0	0	0	1	1	3	1

UCSF4 TEAM 3, FEMALE-38, PROBE MOVEMENT, REMOVE-4 WISDOM TEETH

TIME MIN	CONC PPM	N2O %	PULL POKE	PROBE DIST.	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
37 75	16	0	0	11	0	0	0	0	0	1	1	3	1
38 00	44	0	0	11	0	0	0	0	0	1	1	3	1
38 25	60	0	0	11	0	0	0	0	0	0	1	3	1
38 50	69	0	1	11	0	0	0	0	0	0	1	3	1
38 75	111	0	1	11	0	1	0	0	0	0	1	3	1
39 00	70	0	1	11	0	1	0	0	0	0	1	3	1
39 25	25	0	1	11	0	1	0	0	0	0	1	3	1
39 50	79	0	1	11	0	1	0	0	0	0	1	3	1
39 75	109	0	1	11	0	1	0	0	0	0	1	3	1
40 00	106	0	1	11	0	1	0	0	0	0	1	3	1
40 25	105	0	1	11	0	1	0	0	0	0	1	3	1
40 50	131	0	1	11	0	1	0	0	0	0	1	3	1
40 75	106	0	1	11	0	1	0	0	0	0	1	3	1
41 00	92	0	1	11	0	1	0	0	0	0	1	3	1
41 25	98	0	1	11	0	1	0	0	0	0	1	3	1
41 50	61	0	1	11	0	1	1	0	0	0	1	3	1
41 75	68	0	0	11	0	1	1	0	0	0	1	3	1
42 00	92	0	0	11	0	1	1	0	0	0	1	3	1
42 25	80	0	0	11	0	1	1	0	1	0	1	3	1
42 50	71	0	0	11	0	1	1	0	1	0	1	3	1
42 75	46	0	0	11	0	1	1	0	1	0	1	3	1
43 00	50	0	0	11	0	1	1	0	1	0	1	3	1
43 25	35	0	0	11	0	1	1	0	1	0	1	3	1
43 50	65	0	0	11	0	1	1	0	1	0	1	3	1
43 75	84	0	0	11	0	1	1	0	1	0	1	3	1
44 00	56	0	0	11	0	1	1	0	1	0	1	3	1
44 25	76	0	1	11	0	1	1	0	0	0	1	3	1
44 50	49	0	0	11	0	1	1	0	1	0	1	3	1
44 75	71	0	0	11	0	1	1	0	1	0	1	3	1
45 00	47	0	0	11	0	1	0	0	0	0	1	3	1
45 25	61	0	1	11	0	1	0	0	0	0	1	3	1
45 50	23	0	1	11	0	1	0	0	0	0	1	3	1
45 75	21	0	1	11	0	1	0	0	0	0	1	3	1
46 00	36	0	1	11	0	1	1	0	0	0	1	3	1
46 25	49	0	0	11	0	1	1	0	1	0	1	3	1
46 50	40	0	0	11	0	1	1	0	1	0	1	3	1
46 75	34	0	0	11	0	1	1	0	1	0	1	3	1
47 00	36	0	0	11	0	1	1	0	1	0	1	3	1
47 25	60	0	0	11	0	1	1	0	1	0	1	3	1
47 50	41	0	0	11	0	1	1	0	1	0	1	3	1
47 75	40	0	0	11	0	1	0	0	0	0	1	3	1
48 00	43	0	0	11	0	1	0	0	0	0	1	3	1
48 25	43	0	0	11	0	1	0	0	0	0	1	3	1
48 50	40	0	0	11	0	0	0	0	0	0	1	3	1
48 75	19	0	0	11	0	0	0	0	0	0	1	3	1
49 00	34	0	0	11	0	1	1	0	1	0	1	3	1
49 25	46	0	0	11	0	1	1	0	1	0	1	3	1
49 50	52	0	0	11	0	1	1	0	1	0	1	3	1
49 75	40	0	0	11	0	1	1	0	1	0	1	3	1
50 00	75	0	1	11	0	0	0	0	0	0	1	3	1

UCSF4 TEAM 3, FEMALE-38, PROBE MOVEMENT, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST.	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
50 25	57	0	1	11	0	0	0	0	0	0	1	3	1
50 50	53	0	1	11	0	0	0	0	0	0	1	3	1
50 75	61	0	1	11	0	1	0	0	0	0	1	3	1
51 00	63	0	0	11	0	0	0	0	0	0	1	3	1
51 25	97	0	0	11	0	1	1	0	1	0	1	3	1
51 50	59	0	0	11	0	1	1	0	0	0	1	3	1
51 75	64	0	1	11	0	1	0	0	0	0	1	3	1
52 00	87	0	1	11	0	1	0	0	0	0	1	3	1
52 25	57	0	0	11	0	1	1	0	1	0	1	3	1
52 50	32	0	0	11	0	1	1	0	1	0	1	3	1
52 75	14	0	0	11	0	1	1	0	1	0	1	3	1
53 00	14	0	0	11	0	1	1	0	1	0	1	3	1
53 25	2	0	0	11	0	1	1	0	1	0	1	3	1
53 50	1	0	1	11	0	1	0	0	0	0	1	3	1
53 75	1	0	1	11	0	1	0	0	0	0	1	3	1
54 00	0	0	1	11	0	0	0	0	0	0	1	3	1
54 25	1	0	0	11	0	1	1	0	1	0	1	3	1
54 50	5	0	0	11	0	1	1	0	1	0	1	3	1
54 75	3	0	0	11	0	1	0	0	0	0	1	3	1
55 00	1	0	1	11	0	1	0	0	0	0	1	3	1
55 25	0	0	1	11	0	1	0	0	0	0	1	3	1
55 50	3	0	1	11	0	1	0	0	0	0	1	3	1
55 75	5	0	0	11	0	1	0	0	0	0	1	3	1
56 00	1	0	0	11	0	1	0	0	0	0	1	3	1
56 25	2	0	0	11	0	1	0	0	0	0	1	3	1
56 50	0	0	0	11	0	1	0	0	0	0	1	3	1
56 75	2	0	0	11	0	1	0	0	0	0	1	3	1
57 00	0	0	0	11	0	1	0	0	0	0	1	3	1
57 25	3	0	0	11	0	1	0	0	0	0	1	3	1
57 50	2	0	0	11	0	1	0	0	0	0	1	3	1
57 75	3	0	0	11	0	1	0	0	0	0	1	3	1
58 00	4	0	1	11	0	1	0	0	0	0	1	3	1
58 25	0	0	0	11	0	1	0	0	0	0	1	3	1
58 50	0	0	0	11	0	1	0	0	0	0	1	3	1
58 75	0	0	0	11	0	1	1	0	0	0	1	3	1
59 00	0	0	0	11	0	1	0	0	0	0	1	3	1
59 25	0	0	0	11	0	1	0	0	0	0	1	3	1
59 50	6	0	0	11	0	1	0	0	0	0	1	3	1
59 75	1	0	0	11	0	1	0	0	0	0	1	3	1
60 00	0	0	0	11	0	1	0	0	0	0	1	3	1
60 25	1	0	0	11	0	1	0	0	0	0	1	3	1
60 50	2	0	0	11	0	1	0	0	0	0	1	3	1
60 75	2	0	0	11	0	1	0	0	0	0	1	3	1
61 00	1	0	0	11	0	1	0	0	0	0	1	3	1
61 25	0	0	0	11	0	1	0	0	0	0	1	3	1
61 50	0	0	0	11	0	1	0	0	0	0	1	3	1
61 75	0	0	0	11	0	1	1	0	0	0	1	3	1
62 00	2	0	0	11	0	1	1	0	0	0	1	3	1
62 25	0	0	0	11	0	1	1	0	0	0	1	3	1
62 50	0	0	0	11	0	0	0	0	0	1	1	3	1

UCSF5 TEAM 3, MALE-26, PROBE MOVEMENT, REMOVE-TWO WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST.	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
0 25	0	0	0	0	0	0	0	0	0	0	1	3	2
0 50	0	0	0	0	0	0	0	0	0	0	1	3	2
0 75	0	0	0	0	0	0	0	0	0	0	1	3	2
1 00	0	0	0	0	0	0	0	0	0	0	1	3	2
1 25	0	0	0	0	0	0	0	0	0	1	1	3	2
1 50	0	0	0	0	0	0	0	0	0	0	1	3	2
1 75	0	0	0	0	0	0	0	0	0	1	1	3	2
2 00	0	0	0	0	0	0	0	0	0	0	1	3	2
2 25	0	0	0	0	0	0	0	0	0	0	1	3	2
2 50	0	0	0	8	0	0	0	0	0	0	1	3	2
2 75	0	0	0	8	0	0	0	0	0	0	1	3	2
3 00	0	0	0	8	0	0	0	0	0	0	1	3	2
3 25	1	0	0	8	0	0	0	0	0	0	1	3	2
3 50	0	0	0	8	0	0	0	0	0	0	1	3	2
3 75	0	0	0	8	0	0	0	0	0	0	1	3	2
4 00	1	0	0	8	0	0	0	0	0	0	1	3	2
4 25	0	0	0	8	0	0	0	0	0	0	1	3	2
4 50	0	0	0	8	0	0	0	0	0	0	1	3	2
4 75	3	0	0	8	0	0	0	0	0	0	1	3	2
5 00	4	0	0	8	0	0	0	0	0	0	1	3	2
5 25	6	30	0	8	0	0	0	0	0	0	1	3	2
5 50	0	30	0	8	0	0	0	0	0	0	1	3	2
5 75	0	30	0	8	0	0	0	0	0	0	1	3	2
6 00	0	30	0	8	0	0	0	0	0	0	1	3	2
6 25	0	30	0	8	0	0	0	0	0	0	1	3	2
6 50	0	30	0	8	0	0	0	0	0	0	1	3	2
6 75	0	30	0	8	0	0	0	0	0	0	1	3	2
7 00	63	30	0	8	0	0	0	0	0	0	1	3	2
7 25	115	30	0	8	0	0	0	0	0	1	1	3	2
7 50	72	30	0	8	0	0	0	0	0	0	1	3	2
7 75	92	30	0	8	0	0	0	0	0	0	1	3	2
8 00	159	30	0	8	0	0	0	0	0	1	1	3	2
8 25	81	30	0	8	0	0	0	0	0	0	1	3	2
8 50	116	30	0	9	0	0	0	0	0	0	1	3	2
8 75	177	30	0	9	0	0	0	0	0	0	1	3	2
9 00	193	30	0	9	0	0	0	0	0	0	1	3	2
9 25	366	30	0	9	0	0	0	0	0	0	1	3	2
9 50	96	30	0	9	0	0	0	0	0	1	1	3	2
9 75	19	30	0	9	0	0	0	0	0	0	1	3	2
10 00	29	30	0	9	0	0	0	0	0	0	1	3	2
10 25	10	30	0	9	0	0	0	0	0	1	1	3	2
10 50	23	30	0	8	0	0	0	0	0	0	1	3	2
10 75	170	30	0	8	0	0	0	0	0	0	1	3	2
11 00	82	30	0	8	0	0	0	0	0	0	1	3	2
11 25	40	30	0	8	0	0	0	0	0	0	1	3	2
11 50	163	30	0	8	0	0	0	0	0	0	1	3	2
11 75	216	30	0	8	0	0	0	0	0	0	1	3	2
12 00	173	30	0	8	0	0	0	0	0	0	1	3	2
12 25	37	30	0	8	0	0	0	1	0	0	1	3	2
12 50	59	30	0	8	0	0	0	1	0	0	1	3	2

UCSF5 TEAM 3, MALE-26, PROBE MOVEMENT, REMOVE-TWO WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
12 75	540	30	0	8	0	0	0	1	0	0	1	3	2
13 00	386	30	0	8	0	0	0	1	0	0	1	3	2
13 25	254	30	0	8	0	0	0	0	0	0	1	3	2
13 50	759	30	0	8	0	0	0	0	0	0	1	3	2
13 75	433	30	0	8	0	0	0	0	0	1	1	3	2
14 00	163	30	1	8	0	0	0	0	0	0	1	3	2
14 25	93	30	1	8	0	0	0	0	0	0	1	3	2
14 50	323	30	0	8	0	0	0	0	0	0	1	3	2
14 75	147	30	1	8	0	0	0	0	0	0	1	3	2
15 00	98	30	0	8	1	0	0	0	0	0	1	3	2
15 25	207	30	0	8	1	0	0	0	0	0	1	3	2
15 50	67	30	0	8	0	0	0	0	0	0	1	3	2
15 75	63	30	0	8	1	0	0	0	0	0	1	3	2
16 00	22	30	0	8	0	0	0	0	0	0	1	3	2
16 25	149	30	0	8	0	0	0	0	0	0	1	3	2
16 50	212	30	0	8	0	0	0	0	0	0	1	3	2
16 75	408	30	0	8	0	0	0	0	0	0	1	3	2
17 00	186	30	0	8	0	0	0	0	0	0	1	3	2
17 25	145	30	0	8	0	0	0	0	0	0	1	3	2
17 50	261	30	0	8	0	0	0	0	0	0	1	3	2
17 75	222	30	0	8	0	0	0	0	0	0	1	3	2
18 00	111	30	0	8	0	1	0	0	0	0	1	3	2
18 25	80	30	0	8	1	1	0	0	0	0	1	3	2
18 50	203	30	0	8	1	1	0	0	0	0	1	3	2
18 75	113	30	1	8	1	1	0	0	0	0	1	3	2
19 00	84	30	1	8	1	1	0	0	0	0	1	3	2
19 25	51	30	1	8	1	1	0	0	0	0	1	3	2
19 50	24	30	1	8	0	1	0	0	0	1	1	3	2
19 75	58	30	1	8	0	1	0	0	0	1	1	3	2
20 00	34	30	0	8	0	0	0	0	0	1	1	3	2
20 25	37	30	0	8	0	0	0	0	0	0	1	3	2
20 50	49	30	0	8	0	1	0	0	0	1	1	3	2
20 75	19	30	1	8	0	1	0	0	0	0	1	3	2
21 00	12	30	1	8	0	1	0	0	0	0	1	3	2
21 25	14	30	1	8	0	1	0	0	0	0	1	3	2
21 50	22	30	1	8	0	1	0	0	0	0	1	3	2
21 75	29	30	1	8	0	1	0	0	0	0	1	3	2
22 00	22	30	1	8	0	1	0	0	0	0	1	3	2
22 25	46	30	0	8	0	1	0	0	1	1	1	3	2
22 50	171	30	0	8	0	1	0	0	1	1	1	3	2
22 75	120	30	0	8	1	1	0	0	0	0	1	3	2
23 00	32	30	0	8	1	1	0	0	0	0	1	3	2
23 25	19	30	0	8	0	1	0	0	0	1	1	3	2
23 50	16	30	0	8	0	1	0	0	0	0	1	3	2
23 75	25	30	1	8	0	1	0	0	0	1	1	3	2
24 00	19	30	0	8	0	1	0	0	0	1	1	3	2
24 25	52	30	0	8	0	1	0	0	0	1	1	3	2
24 50	162	30	0	8	0	1	0	0	0	1	1	3	2
24 75	129	30	1	8	0	1	0	0	0	0	1	3	2
25 00	116	30	1	8	0	1	0	0	0	0	1	3	2

UCSF5 TEAM 3, MALE-26, PROBE MOVEMENT, REMOVE-TWO WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
25 25	174	30	1	8	0	1	0	0	0	0	1	3	2
25 50	115	30	1	8	0	1	0	0	0	0	1	3	2
25 75	60	30	0	8	0	1	0	0	0	1	1	3	2
26 00	35	30	1	8	0	1	0	0	0	0	1	3	2
26 25	41	30	0	8	0	1	0	0	0	0	1	3	2
26 50	25	0	1	8	0	1	0	0	0	0	1	3	2
26 75	37	0	1	8	0	1	0	0	0	0	1	3	2
27 00	65	0	0	8	0	1	0	0	0	1	1	3	2
27 25	10	0	0	8	0	1	0	0	0	1	1	3	2
27 50	3	0	0	8	0	1	0	0	0	1	1	3	2
27 75	11	0	0	8	0	1	0	0	0	1	1	3	2
28 00	13	0	0	8	0	1	0	0	0	1	1	3	2
28 25	15	0	0	8	0	1	0	0	0	0	1	3	2
28 50	8	0	0	8	0	0	0	0	0	1	1	3	2
28 75	15	0	0	8	0	0	0	0	0	0	1	3	2
29 00	41	0	0	8	0	0	0	0	0	1	1	3	2
29 25	85	0	0	8	0	0	0	0	0	0	1	3	2
29 50	33	0	0	8	0	0	0	0	0	0	1	3	2
29 75	33	0	0	8	0	0	0	0	0	0	1	3	2
30 00	17	0	0	8	0	0	0	0	0	1	1	3	2
30 25	13	0	0	8	0	0	0	0	0	0	1	3	2
30 50	9	0	0	8	0	0	0	1	0	0	1	3	2
30 75	17	0	0	8	0	0	0	0	0	0	1	3	2
31 00	25	0	0	8	0	0	0	0	0	0	1	3	2
31 25	6	0	0	8	0	0	0	0	0	0	1	3	2
31 50	20	0	0	8	0	0	0	0	0	0	1	3	2
31 75	50	0	0	8	0	0	0	0	0	0	1	3	2
32 00	24	0	0	8	0	0	0	0	0	0	1	3	2
32 25	9	0	0	8	0	0	0	0	0	0	1	3	2
32 50	5	0	0	8	0	0	0	0	0	0	1	3	2
32 75	11	0	0	8	0	0	0	0	0	0	1	3	2
33 00	7	0	0	8	0	0	0	0	0	1	1	3	2
33 25	5	0	0	8	0	0	0	0	0	0	1	3	2
33 50	2	0	0	8	0	0	0	0	0	0	1	3	2
33 75	0	0	0	8	0	0	0	0	0	1	1	3	2
34 00	1	0	0	8	0	0	0	0	0	0	1	3	2
34 25	1	0	0	8	0	0	0	0	0	0	1	3	2
34 50	1	0	0	8	0	0	0	0	0	0	1	3	2
34 75	0	0	0	8	0	0	0	0	0	0	1	3	2
35 00	0	0	0	8	0	0	0	0	0	0	1	3	2
35 25	0	0	0	8	0	0	0	0	0	0	1	3	2
35 50	0	0	0	8	0	0	0	0	0	0	1	3	2
35 75	0	0	0	8	0	0	0	0	0	0	1	3	2
36 00	0	0	0	8	0	0	0	0	0	0	1	3	2
36 25	0	0	0	8	0	0	0	0	0	0	1	3	2
36 50	0	0	0	8	0	0	0	0	0	0	1	3	2
36 75	0	0	0	8	0	0	0	0	0	0	1	3	2
37 00	0	0	0	8	0	0	0	0	0	0	1	3	2
37 25	0	0	0	8	0	0	0	0	0	0	1	3	2
37 50	0	0	0	8	0	0	0	0	0	0	1	3	2

UCSF5 TEAM 3, MALE-26, PROBE MOVEMENT, REMOVE-TWO WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
37 75	0	0	0	8	0	0	0	0	0	0	1	3	2
38 00	0	0	0	8	0	0	0	0	0	0	1	3	2
38 25	0	0	0	8	0	0	0	0	0	0	1	3	2
38 50	0	0	0	8	0	0	0	0	0	0	1	3	2
38 75	0	0	0	8	0	0	0	0	0	0	1	3	2
39 00	0	0	0	8	0	0	0	0	0	0	1	3	2
39 25	0	0	0	8	0	0	0	0	0	0	1	3	2
39 50	0	0	0	8	0	0	0	0	0	0	1	3	2
39 75	0	0	0	8	0	0	0	0	0	0	1	3	2
40 00	0	0	0	8	0	0	0	0	0	0	1	3	2
40 25	0	0	0	8	0	0	0	0	0	0	1	3	2
40 50	0	0	0	8	0	0	0	0	0	0	1	3	2
40 75	0	0	0	8	0	0	0	0	0	0	1	3	2
41 00	0	0	0	8	0	0	0	0	0	0	1	3	2
41 25	0	0	0	8	0	0	0	0	0	0	1	3	2
41 50	0	0	0	8	0	0	0	0	0	0	1	3	2
41 75	0	0	0	8	0	0	0	0	0	0	1	3	2
42 00	0	0	0	8	0	0	0	0	0	0	1	3	2
42 25	0	0	0	8	0	0	0	0	0	0	1	3	2
42 50	0	0	0	8	0	0	0	0	0	0	1	3	2
42 75	0	0	0	8	0	0	0	0	0	0	1	3	2
43 00	0	0	0	8	0	0	0	0	0	0	1	3	2
43 25	0	0	0	8	0	0	0	0	0	0	1	3	2
43 50	0	0	0	8	0	0	0	0	0	0	1	3	2
43 75	0	0	0	8	0	0	0	0	0	0	1	3	2
44 00	0	0	0	8	0	0	0	0	0	0	1	3	2

UCSF6 TEAM 4, FEMALE-22, PROBE 10" FROM CONE, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
0 25	0	0	0	10	0	0	0	0	0	0	1	4	1
0 50	0	0	0	10	0	0	0	0	0	0	1	4	1
0 75	0	0	0	10	0	0	0	0	0	0	1	4	1
1 00	0	0	0	10	0	0	0	0	0	0	1	4	1
1 25	0	0	0	10	0	0	0	0	0	0	1	4	1
1 50	0	0	0	10	0	0	0	0	0	0	1	4	1
1 75	0	0	0	10	0	0	0	0	0	0	1	4	1
2 00	0	0	0	10	0	0	0	0	0	0	1	4	1
2 25	0	0	0	10	0	0	0	0	0	0	1	4	1
2 50	0	0	0	10	0	0	0	0	0	0	1	4	1
2 75	0	0	0	10	0	0	0	0	0	0	1	4	1
3 00	0	0	0	10	0	0	0	0	0	0	1	4	1
3 25	0	0	0	10	0	0	0	0	0	0	1	4	1
3 50	0	0	0	10	0	0	0	0	0	0	1	4	1
3 75	0	0	0	10	0	0	0	0	0	0	1	4	1
4 00	0	0	0	10	0	0	0	0	0	0	1	4	1
4 25	0	0	0	10	0	0	0	0	0	0	1	4	1
4 50	0	0	0	10	0	0	0	0	0	0	1	4	1
4 75	0	0	0	10	0	0	0	0	0	0	1	4	1
5 00	0	0	0	10	0	0	0	0	0	0	1	4	1
5 25	0	0	0	10	0	0	0	0	0	0	1	4	1
5 50	0	0	0	10	0	0	0	0	0	0	1	4	1
5 75	0	0	0	10	0	0	0	0	0	0	1	4	1
6 00	0	0	0	10	0	0	0	0	0	0	1	4	1
6 25	0	0	0	10	0	0	0	0	0	0	1	4	1
6 50	0	0	0	10	0	0	0	0	0	0	1	4	1
6 75	0	0	0	10	0	0	0	0	0	0	1	4	1
7 00	0	0	0	10	0	0	0	0	0	0	1	4	1
7 25	0	0	0	10	0	0	0	0	0	0	1	4	1
7 50	0	0	0	10	0	0	0	0	0	0	1	4	1
7 75	0	0	0	10	0	0	0	0	0	0	1	4	1
8 00	0	0	0	10	0	0	0	0	0	0	1	4	1
8 25	0	0	0	10	0	0	0	0	0	0	1	4	1
8 50	0	50	0	10	0	0	0	0	0	1	1	4	1
8 75	0	50	0	10	0	0	0	0	0	0	1	4	1
9 00	0	50	0	10	0	0	0	0	0	0	1	4	1
9 25	0	50	0	10	0	0	0	0	0	0	1	4	1
9 50	0	50	0	10	0	0	0	0	0	1	1	4	1
9 75	0	50	0	10	0	0	0	0	0	0	1	4	1
10 00	0	50	0	10	0	0	0	0	0	0	1	4	1
10 25	0	50	0	10	0	0	0	0	0	0	1	4	1
10 50	0	50	0	10	0	0	0	0	0	0	1	4	1
10 75	0	50	0	10	0	0	0	0	0	0	1	4	1
11 00	0	50	0	10	0	0	0	0	0	0	1	4	1
11 25	0	50	0	10	0	0	0	0	0	0	1	4	1
11 50	0	50	0	10	0	0	0	0	0	0	1	4	1
11 75	0	50	0	10	0	0	0	0	0	0	1	4	1
12 00	1	50	0	10	0	0	0	0	0	0	1	4	1
12 25	0	50	0	10	0	0	0	0	0	0	1	4	1
12 50	1	50	0	10	0	0	0	0	0	0	1	4	1

UCSF6 TEAM 4, FEMALE-22, PROBE 10" FROM CONE, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
12 75	4	50	0	10	0	0	0	0	0	0	1	4	1
13 00	10	50	0	10	0	0	0	0	0	0	1	4	1
13 25	510	50	0	10	0	0	0	0	0	0	1	4	1
13 50	825	50	0	10	0	0	0	0	0	0	1	4	1
13 75	385	50	0	14	0	0	0	0	0	0	1	4	1
14 00	265	50	0	14	0	0	0	0	0	0	1	4	1
14 25	287	50	0	14	0	0	0	0	0	0	1	4	1
14 50	290	50	0	14	0	0	0	0	0	0	1	4	1
14 75	222	50	0	14	0	0	0	0	0	0	1	4	1
15 00	261	50	0	14	0	0	0	0	0	0	1	4	1
15 25	181	50	0	14	0	0	0	0	0	0	1	4	1
15 50	102	50	0	14	0	0	0	0	0	0	1	4	1
15 75	109	50	0	14	0	0	0	0	0	0	1	4	1
16 00	124	50	0	14	0	0	0	0	0	0	1	4	1
16 25	95	50	1	14	0	0	0	0	0	0	1	4	1
16 50	50	50	1	14	0	0	0	0	0	0	1	4	1
16 75	115	50	0	14	0	0	0	0	0	0	1	4	1
17 00	162	50	0	14	0	0	0	0	0	0	1	4	1
17 25	111	50	0	14	0	0	0	0	0	0	1	4	1
17 50	122	50	0	14	0	0	0	0	0	1	1	4	1
17 75	103	50	0	14	1	0	0	0	0	0	1	4	1
18 00	106	50	0	14	1	0	0	0	0	0	1	4	1
18 25	53	50	0	14	1	0	0	0	0	0	1	4	1
18 50	32	50	0	14	1	0	0	0	0	0	1	4	1
18 75	118	50	0	14	0	0	0	0	0	0	1	4	1
19 00	158	50	0	14	1	0	0	0	0	0	1	4	1
19 25	207	50	0	14	1	0	0	0	0	0	1	4	1
19 50	84	50	0	14	0	0	0	0	0	0	1	4	1
19 75	109	50	0	14	0	0	0	0	0	1	1	4	1
20 00	271	50	0	14	1	0	0	0	0	0	1	4	1
20 25	207	50	0	14	1	0	0	0	0	0	1	4	1
20 50	83	50	0	14	1	0	0	0	0	0	1	4	1
20 75	97	50	0	14	1	0	0	0	0	0	1	4	1
21 00	191	50	0	14	1	0	0	0	0	0	1	4	1
21 25	94	50	0	14	1	0	0	0	0	0	1	4	1
21 50	51	50	0	14	1	0	0	0	0	0	1	4	1
21 75	58	50	0	14	1	0	0	0	0	0	1	4	1
22 00	62	50	0	14	1	0	0	0	0	0	1	4	1
22 25	36	50	0	14	1	0	0	0	0	0	1	4	1
22 50	44	50	0	14	1	0	0	0	0	0	1	4	1
22 75	44	50	0	14	1	0	0	0	0	0	1	4	1
23 00	49	50	0	14	1	0	0	0	0	0	1	4	1
23 25	21	50	0	14	1	0	0	0	0	0	1	4	1
23 50	24	50	0	14	1	0	0	0	0	0	1	4	1
23 75	73	50	0	14	0	0	0	0	0	0	1	4	1
24 00	187	50	0	14	0	1	0	1	0	1	1	4	1
24 25	159	50	0	14	0	1	0	1	0	0	1	4	1
24 50	211	50	0	14	0	0	0	1	0	0	1	4	1
24 75	374	50	0	14	0	0	0	1	0	0	1	4	1
25 00	597	50	0	14	0	0	0	1	0	1	1	4	1

UCSF6 TEAM 4, FEMALE-22, PROBE 10" FROM CONE, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
25 25	438	50	0	14	0	0	0	0	0	0	1	4	1
25 50	287	50	0	14	1	0	0	0	0	0	1	4	1
25 75	185	50	0	14	1	0	0	0	0	0	1	4	1
26 00	246	50	0	14	0	0	0	0	0	0	1	4	1
26 25	428	50	0	14	0	0	0	0	0	0	1	4	1
26 50	701	50	0	14	0	0	0	1	0	0	1	4	1
26 75	861	50	0	14	0	0	0	1	0	0	1	4	1
27 00	525	50	0	14	0	0	0	1	0	0	1	4	1
27 25	318	50	0	14	0	0	0	1	0	0	1	4	1
27 50	124	50	0	14	0	0	0	1	0	0	1	4	1
27 75	188	50	0	14	1	0	0	0	0	0	1	4	1
28 00	251	50	0	14	0	0	0	0	0	0	1	4	1
28 25	204	50	0	14	0	0	0	0	0	0	1	4	1
28 50	224	50	1	14	0	1	0	0	0	0	1	4	1
28 75	915	50	1	14	0	1	0	0	0	0	1	4	1
29 00	270	50	1	14	0	1	0	0	0	0	1	4	1
29 25	216	50	1	14	0	1	0	1	0	0	1	4	1
29 50	316	50	1	14	0	1	0	0	0	0	1	4	1
29 75	163	50	1	14	0	0	0	0	0	0	1	4	1
30 00	102	50	1	14	0	0	0	0	0	0	1	4	1
30 25	113	50	0	14	1	0	0	1	0	0	1	4	1
30 50	206	50	0	14	1	0	0	0	0	0	1	4	1
30 75	176	50	0	14	1	0	0	0	0	0	1	4	1
31 00	532	50	0	14	0	0	0	0	0	0	1	4	1
31 25	301	50	0	14	0	1	0	1	0	1	1	4	1
31 50	156	50	1	14	0	1	0	0	0	0	1	4	1
31 75	76	50	1	14	0	1	0	0	0	0	1	4	1
32 00	122	50	1	14	0	1	0	1	0	0	1	4	1
32 25	98	50	1	14	0	1	0	0	0	0	1	4	1
32 50	110	50	0	14	0	1	0	0	0	1	1	4	1
32 75	69	50	0	14	0	0	0	0	0	1	1	4	1
33 00	32	50	0	14	0	0	0	0	0	1	1	4	1
33 25	27	50	0	14	0	0	0	0	0	0	1	4	1
33 50	64	50	0	14	0	0	0	1	0	1	1	4	1
33 75	138	50	0	14	0	0	0	0	0	1	1	4	1
34 00	369	50	1	14	0	1	0	0	0	0	1	4	1
34 25	508	50	1	14	0	1	0	0	0	0	1	4	1
34 50	225	50	1	14	0	1	0	0	0	0	1	4	1
34 75	123	50	1	14	0	1	0	0	0	0	1	4	1
35 00	201	50	0	14	0	1	0	0	0	1	1	4	1
35 25	190	50	0	14	0	1	0	0	0	1	1	4	1
35 50	164	50	0	14	0	1	0	0	0	1	1	4	1
35 75	160	50	0	14	0	1	0	0	0	1	1	4	1
36 00	82	50	0	14	0	0	0	0	0	1	1	4	1
36 25	67	50	0	14	0	0	0	0	0	1	1	4	1
36 50	95	0	0	14	0	0	0	0	0	1	1	4	1
36 75	50	0	0	14	0	0	0	1	0	1	1	4	1
37 00	55	0	0	14	0	0	0	1	0	0	1	4	1
37 25	114	0	0	14	0	0	0	0	0	0	1	4	1
37 50	81	0	0	14	0	0	0	0	0	0	1	4	1

UCSF6 TEAM 4, FEMALE-22, PROBE 10* FROM CONE, REMOVE-4 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
37 75	33	0	0	14	0	0	0	0	0	1	1	4	1
38 00	98	0	0	14	0	0	0	0	0	0	1	4	1
38 25	109	0	0	14	0	0	0	0	0	0	1	4	1
38 50	65	0	0	14	0	0	0	0	0	1	1	4	1
38 75	78	0	0	14	0	0	0	0	0	1	1	4	1
39 00	39	0	0	14	0	0	0	0	0	0	1	4	1
39 25	44	0	0	14	0	0	0	0	0	0	1	4	1
39 50	47	0	0	14	0	0	0	0	0	0	1	4	1
39 75	33	0	0	14	0	0	0	0	0	0	1	4	1
40 00	17	0	0	14	0	0	0	0	0	0	1	4	1
40 25	14	0	0	14	0	0	0	0	0	0	1	4	1
40 50	14	0	0	14	0	0	0	0	0	0	1	4	1
40 75	15	0	0	14	0	0	0	0	0	0	1	4	1
41 00	40	0	0	14	0	0	0	0	0	0	1	4	1
41 25	38	0	0	14	0	0	0	0	0	0	1	4	1
41 50	66	0	0	14	0	0	0	0	0	0	1	4	1
41 75	29	0	0	14	0	0	0	0	0	0	1	4	1
42 00	14	0	0	14	0	0	0	0	0	0	1	4	1
42 25	11	0	0	14	0	0	0	0	0	0	1	4	1
42 50	9	0	0	14	0	0	0	0	0	0	1	4	1
42 75	7	0	0	14	0	0	0	0	0	0	1	4	1
43 00	5	0	0	14	0	0	0	0	0	0	1	4	1
43 25	3	0	0	14	0	0	0	0	0	0	1	4	1
43 50	3	0	0	14	0	0	0	0	0	0	1	4	1
43 75	3	0	0	14	0	0	0	0	0	0	1	4	1
44 00	2	0	0	14	0	0	0	0	0	0	1	4	1
44 25	2	0	0	14	0	0	0	0	0	0	1	4	1
44 50	1	0	0	14	0	0	0	0	0	0	1	4	1
44 75	1	0	0	14	0	0	0	0	0	0	1	4	1
45 00	1	0	0	14	0	0	0	0	0	0	1	4	1
45 25	0	0	0	14	0	0	0	0	0	0	1	4	1
45 50	0	0	0	14	0	0	0	0	0	0	1	4	1
45 75	0	0	0	14	0	0	0	0	0	0	1	4	1

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
0 25	0	0	0	10	0	0	0	0	0	0	1	3	5
0 50	0	0	0	10	0	0	0	0	0	0	1	3	5
0 75	0	0	0	10	0	0	0	0	0	0	1	3	5
1 00	0	0	0	10	0	0	0	0	0	0	1	3	5
1 25	0	0	0	10	0	0	0	0	0	0	1	3	5
1 50	0	0	0	10	0	0	0	0	0	0	1	3	5
1 75	0	0	0	10	0	0	0	0	0	0	1	3	5
2 00	0	0	0	10	0	0	0	0	0	0	1	3	5
2 25	0	0	0	10	0	0	0	0	0	0	1	3	5
2 50	0	0	0	10	0	0	0	0	0	0	1	3	5
2 75	0	0	0	10	0	0	0	0	0	0	1	3	5
3 00	0	0	0	10	0	0	0	0	0	0	1	3	5
3 25	0	0	0	10	0	0	0	0	0	0	1	3	5
3 50	0	0	0	10	0	0	0	0	0	0	1	3	5
3 75	0	0	0	10	0	0	0	0	0	0	1	3	5
4 00	0	0	0	10	0	0	0	0	0	0	1	3	5
4 25	0	0	0	10	0	0	0	0	0	0	1	3	5
4 50	0	0	0	10	0	0	0	0	0	0	1	3	5
4 75	0	0	0	10	0	0	0	0	0	0	1	3	5
5 00	0	0	0	10	0	0	0	0	0	0	1	3	5
5 25	0	0	0	10	0	0	0	0	0	0	1	3	5
5 50	0	0	0	10	0	0	0	0	0	1	1	3	5
5 75	2	0	0	10	0	0	0	0	0	0	1	3	5
6 00	55	0	0	10	0	0	0	0	0	0	1	3	5
6 25	97	0	0	10	0	0	0	0	0	0	1	3	5
6 50	43	0	0	10	0	0	0	0	0	1	1	3	5
6 75	119	0	0	10	0	0	0	0	0	0	1	3	5
7 00	63	0	0	10	0	0	0	0	0	0	1	3	5
7 25	32	0	0	10	0	0	0	0	0	0	1	3	5
7 50	15	0	0	12	0	0	0	0	0	0	1	3	5
7 75	9	0	0	12	0	0	0	0	0	1	1	3	5
8 00	5	0	0	12	0	0	0	0	0	0	1	3	5
8 25	9	0	0	12	0	0	0	0	0	0	1	3	5
8 50	7	0	0	12	0	0	0	0	0	0	1	3	5
8 75	8	0	0	12	0	0	0	0	0	0	1	3	5
9 00	5	0	0	12	0	0	0	0	0	0	1	3	5
9 25	9	0	0	12	0	0	0	0	0	0	1	3	5
9 50	7	0	0	12	0	0	0	0	0	0	1	3	5
9 75	5	30	0	12	0	0	0	0	0	0	1	3	5
10 00	0	30	0	12	0	0	0	0	0	0	1	3	5
10 25	0	30	0	12	0	0	0	0	0	0	1	3	5
10 50	0	30	0	12	0	0	0	0	0	0	1	3	5
10 75	0	30	0	12	0	0	0	0	0	0	1	3	5
11 00	0	30	0	12	0	0	0	0	0	0	1	3	5
11 25	0	30	0	12	0	0	0	0	0	0	1	3	5
11 50	2	30	0	12	0	0	0	0	0	0	1	3	5
11 75	6	30	0	12	0	0	0	0	0	0	1	3	5
12 00	0	30	0	12	0	0	0	0	0	0	1	3	5
12 25	0	30	0	12	0	0	0	0	0	0	1	3	5
12 50	0	30	0	12	0	0	0	0	0	0	1	3	5

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
12 75	0	30	0	12	0	0	0	0	0	0	1	3	5
13 00	0	30	0	12	0	0	0	0	0	0	1	3	5
13 25	0	30	0	12	0	0	0	0	0	0	1	3	5
13 50	0	30	0	12	0	0	0	0	0	0	1	3	5
13 75	0	30	0	12	0	0	0	0	0	0	1	3	5
14 00	0	30	0	12	0	0	0	0	0	0	1	3	5
14 25	0	30	0	12	0	0	0	0	0	0	1	3	5
14 50	0	30	0	12	0	0	0	0	0	0	1	3	5
14 75	0	30	0	12	0	0	0	0	0	0	1	3	5
15 00	0	30	0	12	0	0	0	0	0	0	1	3	5
15 25	0	30	0	12	0	0	0	0	0	0	1	3	5
15 50	0	30	0	12	0	0	0	0	0	0	1	3	5
15 75	0	30	0	12	0	0	0	0	0	0	1	3	5
16 00	0	30	0	12	0	0	0	0	0	1	1	3	5
16 25	0	30	0	12	0	0	0	0	0	0	1	3	5
16 50	0	30	0	12	0	0	0	0	0	0	1	3	5
16 75	0	30	0	12	0	0	0	0	0	0	1	3	5
17 00	37	30	0	12	0	0	0	0	0	0	1	3	5
17 25	40	30	0	12	0	0	0	0	0	0	1	3	5
17 50	19	30	0	12	0	0	0	0	0	1	1	3	5
17 75	74	30	0	12	0	0	0	0	0	0	1	3	5
18 00	8	30	0	12	0	0	0	0	0	0	1	3	5
18 25	5	30	0	12	0	0	0	0	0	0	1	3	5
18 50	1	30	0	12	0	0	0	0	0	0	1	3	5
18 75	25	30	0	12	0	0	0	0	0	0	1	3	5
19 00	125	30	0	12	0	0	0	0	0	0	1	3	5
19 25	85	30	0	12	0	0	0	0	0	0	1	3	5
19 50	25	30	0	12	1	0	0	0	0	0	1	3	5
19 75	15	30	0	12	1	0	0	0	0	0	1	3	5
20 00	24	30	0	12	1	0	0	0	0	0	1	3	5
20 25	11	30	0	12	1	0	0	0	0	0	1	3	5
20 50	1	30	0	12	1	0	0	0	0	0	1	3	5
20 75	48	30	0	12	1	0	0	0	0	0	1	3	5
21 00	48	30	0	12	0	0	0	0	0	0	1	3	5
21 25	15	30	0	12	0	0	0	0	0	0	1	3	5
21 50	18	30	0	12	0	0	0	0	0	0	1	3	5
21 75	13	30	0	12	1	0	0	0	0	0	1	3	5
22 00	120	30	0	12	1	0	0	0	0	0	1	3	5
22 25	57	30	0	12	1	0	0	0	0	0	1	3	5
22 50	71	30	0	12	0	0	0	0	0	1	1	3	5
22 75	26	30	0	12	0	0	0	0	0	0	1	3	5
23 00	14	30	0	12	0	0	0	0	0	0	1	3	5
23 25	42	30	0	12	0	0	0	0	0	0	1	3	5
23 50	93	30	0	14	0	0	0	0	0	1	1	3	5
23 75	44	30	0	14	0	0	0	0	0	1	1	3	5
24 00	14	30	0	14	0	0	0	0	0	0	1	3	5
24 25	2	30	0	14	0	0	0	0	0	0	1	3	5
24 50	1	30	0	14	0	0	0	0	0	1	1	3	5
24 75	1	30	0	14	0	0	0	0	0	1	1	3	5
25 00	55	30	0	14	0	0	0	0	0	1	1	3	5

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
25 25	24	30	0	14	0	0	0	0	0	1	1	3	5
25 50	1	30	0	14	0	0	0	0	0	1	1	3	5
25 75	0	30	0	14	0	0	0	0	0	1	1	3	5
26 00	0	30	0	14	0	0	0	0	0	1	1	3	5
26 25	0	30	0	14	0	0	1	0	0	1	1	3	5
26 50	7	30	1	14	0	0	1	0	0	1	1	3	5
26 75	4	30	1	14	0	0	1	0	0	1	1	3	5
27 00	1	30	1	14	0	1	0	0	0	1	1	3	5
27 25	0	30	1	14	0	1	0	0	0	0	1	3	5
27 50	0	30	1	14	0	1	0	0	0	0	1	3	5
27 75	0	0	1	14	0	1	0	0	0	0	1	3	5
28 00	0	0	0	14	0	0	0	0	0	0	1	3	5
28 25	0	0	0	14	0	0	0	0	0	1	1	3	5
28 50	0	0	0	14	0	0	0	0	0	1	1	3	5
28 75	0	0	1	14	0	0	0	0	0	1	1	3	5
29 00	2	0	1	14	0	0	0	0	0	1	1	3	5
29 25	4	0	1	14	0	1	0	0	0	1	1	3	5
29 50	0	0	0	14	0	1	0	0	0	1	1	3	5
29 75	0	0	0	14	0	1	0	0	0	1	1	3	5
30 00	0	0	0	14	0	1	0	0	0	1	1	3	5
30 25	0	0	0	14	0	1	0	0	0	1	1	3	5
30 50	0	0	0	14	0	1	0	0	0	1	1	3	5
30 75	1	0	1	14	0	1	0	0	0	0	1	3	5
31 00	5	0	0	14	0	1	0	0	0	1	1	3	5
31 25	0	0	0	14	0	1	1	0	0	1	1	3	5
31 50	0	0	0	14	0	1	0	0	0	1	1	3	5
31 75	0	0	0	14	0	1	0	0	0	1	1	3	5
32 00	0	0	0	14	0	1	0	0	0	1	1	3	5
32 25	3	0	0	14	0	1	0	0	0	1	1	3	5
32 50	6	0	0	14	0	1	0	0	0	1	1	3	5
32 75	9	0	0	14	0	1	0	0	0	1	1	3	5
33 00	8	0	0	14	0	1	0	0	0	1	1	3	5
33 25	9	0	0	14	0	1	0	0	0	1	1	3	5
33 50	14	0	0	14	0	1	0	0	0	1	1	3	5
33 75	9	0	0	14	0	1	1	0	0	1	1	3	5
34 00	15	0	0	14	0	1	0	0	0	1	1	3	5
34 25	18	0	0	14	0	1	1	0	0	1	1	3	5
34 50	8	0	0	14	0	1	0	0	0	1	1	3	5
34 75	2	0	0	14	0	1	0	0	0	1	1	3	5
35 00	1	0	0	14	0	1	1	0	0	1	1	3	5
35 25	2	0	0	14	0	1	0	0	0	1	1	3	5
35 50	2	0	0	14	0	1	0	0	0	1	1	3	5
35 75	1	0	0	14	0	1	0	0	0	1	1	3	5
36 00	2	0	0	14	0	1	0	0	0	1	1	3	5
36 25	2	0	0	14	0	1	0	0	0	1	1	3	5
36 50	1	0	0	14	0	1	0	0	0	1	1	3	5
36 75	1	0	0	14	0	1	0	0	0	1	1	3	5
37 00	0	0	0	14	0	1	0	0	0	1	1	3	5
37 25	2	0	0	14	0	1	0	0	1	0	1	3	5
37 50	11	0	0	14	0	1	0	0	1	0	1	3	5

CSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
37 75	19	0	0	14	0	1	0	0	1	0	1	3	5
38 00	9	0	0	14	0	1	0	0	1	0	1	3	5
38 25	7	0	0	14	0	1	0	0	1	0	1	3	5
38 50	0	0	0	14	0	1	0	0	1	0	1	3	5
38 75	0	0	0	14	0	1	0	0	1	0	1	3	5
39 00	0	0	0	14	0	1	0	0	1	0	1	3	5
39 25	4	0	0	14	0	1	0	0	1	0	1	3	5
39 50	2	0	0	14	0	1	0	0	1	0	1	3	5
39 75	1	0	0	14	0	1	0	0	1	0	1	3	5
40 00	9	0	0	14	0	1	0	0	1	0	1	3	5
40 25	7	0	0	14	0	1	0	0	1	0	1	3	5
40 50	1	0	0	14	0	1	0	0	1	0	1	3	5
40 75	0	0	0	14	0	1	0	0	1	0	1	3	5
41 00	0	0	0	14	0	1	0	0	1	0	1	3	5
41 25	1	0	0	14	0	1	0	0	1	0	1	3	5
41 50	6	0	0	14	0	1	0	0	1	0	1	3	5
41 75	11	0	0	14	0	1	0	0	1	0	1	3	5
42 00	1	0	0	14	0	1	0	0	1	0	1	3	5
42 25	0	0	0	14	0	1	0	0	1	0	1	3	5
42 50	0	0	0	14	0	1	0	0	1	0	1	3	5
42 75	2	0	0	14	0	1	0	0	1	0	1	3	5
43 00	0	0	0	14	0	1	0	0	1	0	1	3	5
43 25	1	0	0	14	0	1	0	0	1	0	1	3	5
43 50	1	0	0	14	0	1	0	0	1	0	1	3	5
43 75	1	0	0	14	0	1	0	0	1	0	1	3	5
44 00	0	0	0	14	0	1	0	0	1	0	1	3	5
44 25	0	0	0	14	0	1	0	0	1	0	1	3	5
44 50	0	0	0	14	0	1	0	0	1	0	1	3	5
44 75	2	0	0	14	0	1	0	0	1	0	1	3	5
45 00	1	0	0	14	0	1	0	0	1	0	1	3	5
45 25	0	0	0	14	0	1	0	0	0	0	1	3	5
45 50	0	0	0	14	0	1	0	0	0	0	1	3	5
45 75	0	0	0	14	0	1	0	0	0	0	1	3	5
46 00	0	0	0	14	0	1	0	0	0	0	1	3	5
46 25	5	0	0	14	0	1	0	0	0	0	1	3	5
46 50	0	0	0	14	0	1	0	0	0	0	1	3	5
46 75	0	0	0	14	0	1	0	0	0	0	1	3	5
47 00	0	0	0	14	0	1	0	0	0	0	1	3	5
47 25	0	0	0	14	0	1	0	0	0	0	1	3	5
47 50	0	0	0	14	0	1	0	0	0	0	1	3	5
47 75	0	0	0	14	0	0	0	0	0	0	1	3	5
48 00	0	0	0	14	0	0	0	0	0	0	1	3	5
48 25	0	0	0	14	0	0	0	0	0	0	1	3	5
48 50	5	0	0	14	0	0	0	0	0	0	1	3	5
48 75	8	0	0	14	0	0	0	0	0	0	1	3	5
49 00	2	0	0	14	0	0	0	0	0	0	1	3	5
49 25	1	0	0	14	0	0	0	0	0	0	1	3	5
49 50	2	0	0	14	0	0	0	0	0	0	1	3	5
49 75	0	0	0	14	0	0	0	0	0	0	1	3	5
50 00	0	0	0	14	0	0	0	0	0	0	1	3	5

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
50 25	0	0	0	14	0	0	0	0	0	0	1	3	5
50 50	11	0	0	14	0	0	0	0	0	0	1	3	5
50 75	8	0	0	14	0	0	0	0	0	0	1	3	5
51 00	3	0	0	14	0	0	0	0	0	0	1	3	5
51 25	3	0	0	14	0	0	0	0	0	0	1	3	5
51 50	0	0	0	14	0	0	0	0	0	0	1	3	5
51 75	0	0	0	14	0	0	0	0	0	0	1	3	5
52 00	0	0	0	14	0	0	0	0	0	0	1	3	5
52 25	0	0	0	14	0	0	0	0	0	0	1	3	5
52 50	0	0	0	14	0	0	0	0	0	0	1	3	5
52 75	0	0	0	14	0	0	0	0	0	0	1	3	5
53 00	0	0	0	14	0	0	0	0	0	0	1	3	5
53 25	0	0	0	14	0	0	0	0	0	0	1	3	5
53 50	1	0	0	14	0	0	0	0	0	0	1	3	5
53 75	0	0	0	14	0	0	0	0	0	0	1	3	5
54 00	6	0	0	14	0	0	0	0	0	0	1	3	5
54 25	1	0	0	14	0	0	0	0	0	0	1	3	5
54 50	3	0	0	14	0	0	0	0	0	0	1	3	5
54 75	5	0	0	14	0	0	0	0	0	0	1	3	5
55 00	8	0	0	14	0	0	0	0	0	0	1	3	5
55 25	8	0	0	14	0	0	0	0	0	0	1	3	5
55 50	5	0	0	14	0	0	0	0	0	0	1	3	5
55 75	0	0	0	14	0	0	0	0	0	0	1	3	5
56 00	0	0	0	14	0	0	0	0	0	0	1	3	5
56 25	0	0	0	14	0	0	0	0	0	0	1	3	5
56 50	4	0	0	14	0	0	0	0	0	0	1	3	5
56 75	0	0	0	14	0	0	0	0	0	0	1	3	5
57 00	0	0	0	14	0	0	0	0	0	0	1	3	5
57 25	0	0	0	14	0	0	0	0	0	0	1	3	5
57 50	0	0	0	14	0	0	0	0	0	0	1	3	5
57 75	0	0	0	14	0	0	0	0	0	0	1	3	5
58 00	0	0	0	14	0	0	0	0	0	0	1	3	5
58 25	0	0	0	14	0	0	0	0	0	0	1	3	5
58 50	0	0	0	14	0	0	0	0	0	0	1	3	5
58 75	0	0	0	14	0	0	0	0	0	0	1	3	5
59 00	0	0	0	14	0	0	0	0	0	0	1	3	5
59 25	0	0	0	14	0	0	0	0	0	0	1	3	5
59 50	0	0	0	14	0	0	0	0	0	0	1	3	5
59 75	0	0	0	14	0	0	0	0	0	0	1	3	5
60 00	0	0	0	14	0	0	0	0	0	0	1	3	5
60 25	0	0	0	14	0	0	0	0	0	0	1	3	5
60 50	0	0	0	14	0	0	0	0	0	0	1	3	5
60 75	0	0	0	14	0	0	0	0	0	0	1	3	5
61 00	0	0	0	14	0	0	0	0	0	0	1	3	5
61 25	0	0	0	14	0	0	0	0	0	0	1	3	5
61 50	0	0	0	14	0	0	0	0	0	0	1	3	5
61 75	0	0	0	14	0	0	0	0	0	0	1	3	5
62 00	0	0	0	14	0	0	0	0	0	0	1	3	5
62 25	0	0	0	14	0	0	0	0	0	0	1	3	5
62 50	1	0	0	14	0	0	0	0	0	0	1	3	5

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE			PATIENT				TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
62 75	2	0	0	14	0	0	0	0	0	0	1	3	5
63 00	10	0	0	14	0	0	0	0	0	0	1	3	5
63 25	10	0	0	14	0	0	0	0	0	0	1	3	5
63 50	0	0	0	14	0	0	0	0	0	0	1	3	5
63 75	0	0	0	14	0	0	0	0	0	0	1	3	5
64 00	0	0	0	14	0	0	0	0	0	0	1	3	5
64 25	0	0	0	14	0	0	0	0	0	0	1	3	5
64 50	0	0	0	14	0	0	0	0	0	0	1	3	5
64 75	0	0	0	14	0	0	0	0	0	0	1	3	5
65 00	0	0	0	14	0	0	0	0	0	0	1	3	5
65 25	0	0	0	14	0	0	0	0	0	0	1	3	5
65 50	0	0	0	14	0	0	0	0	0	0	1	3	5
65 75	0	0	0	14	0	0	0	0	0	0	1	3	5
66 00	2	0	0	14	0	0	0	0	0	0	1	3	5
66 25	11	0	0	14	0	0	0	0	0	0	1	3	5
66 50	15	0	0	14	0	0	0	0	0	0	1	3	5
66 75	5	0	0	14	0	0	0	0	0	0	1	3	5
67 00	0	0	0	14	0	0	0	0	0	0	1	3	5
67 25	0	0	0	14	0	0	0	0	0	0	1	3	5
67 50	0	0	0	14	0	0	0	0	0	0	1	3	5
67 75	8	0	0	14	0	0	0	0	0	0	1	3	5
68 00	5	0	0	14	0	0	0	0	0	0	1	3	5
68 25	5	0	0	14	0	0	0	0	0	0	1	3	5
68 50	0	0	0	14	0	0	0	0	0	0	1	3	5
68 75	2	0	0	14	0	0	0	0	0	0	1	3	5
69 00	5	0	0	14	0	0	0	0	0	0	1	3	5
69 25	0	0	0	14	0	0	0	0	0	0	1	3	5
69 50	0	0	0	14	0	0	0	0	0	0	1	3	5
69 75	0	0	0	14	0	0	0	0	0	0	1	3	5
70 00	0	0	0	14	0	0	0	0	0	0	1	3	5
70 25	0	0	0	14	0	0	0	0	0	0	1	3	5
70 50	0	0	0	14	0	0	0	0	0	0	1	3	5
70 75	0	0	0	14	0	0	0	0	0	0	1	3	5
71 00	0	0	0	14	0	0	0	0	0	0	1	3	5
71 25	0	0	0	14	0	0	0	0	0	0	1	3	5
71 50	0	0	0	14	0	0	0	0	0	0	1	3	5
71 75	0	0	0	14	0	0	0	0	0	0	1	3	5
72 00	0	0	0	14	0	0	0	0	0	0	1	3	5
72 25	0	0	0	14	0	0	0	0	0	0	1	3	5
72 50	0	0	0	14	0	0	0	0	0	0	1	3	5
72 75	0	0	0	14	0	0	0	0	0	0	1	3	5
73 00	0	0	0	14	0	0	0	0	0	0	1	3	5
73 25	0	0	0	14	0	0	0	0	0	0	1	3	5
73 50	0	0	0	14	0	0	0	0	0	0	1	3	5
73 75	0	0	0	14	0	0	0	0	0	0	1	3	5
74 00	0	0	0	14	0	0	0	0	0	0	1	3	5
74 25	0	0	0	14	0	0	0	0	0	0	1	3	5
74 50	0	0	0	14	0	0	0	0	0	0	1	3	5
74 75	0	0	0	14	0	0	0	0	0	0	1	3	5
75 00	0	0	0	14	0	0	0	0	0	0	1	3	5

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE			PATIENT				TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
75 25	0	0	0	14	0	0	0	0	0	0	1	3	5
75 50	0	0	0	14	0	0	0	0	0	0	1	3	5
75 75	0	0	0	14	0	0	0	0	0	0	1	3	5
76 00	0	0	0	14	0	0	0	0	0	0	1	3	5
76 25	0	0	0	14	0	0	0	0	0	0	1	3	5
76 50	0	0	0	14	0	0	0	0	0	0	1	3	5
76 75	0	0	0	14	0	0	0	0	0	0	1	3	5
77 00	0	0	0	14	0	0	0	0	0	0	1	3	5
77 25	0	0	0	14	0	0	0	0	0	0	1	3	5
77 50	0	0	0	14	0	0	0	0	0	0	1	3	5
77 75	0	0	0	14	0	0	0	0	0	0	1	3	5
78 00	0	0	0	14	0	0	0	0	0	0	1	3	5
78 25	0	0	0	14	0	0	0	0	0	0	1	3	5
78 50	0	0	0	14	0	0	0	0	0	0	1	3	5
78 75	0	0	0	14	0	0	0	0	0	0	1	3	5
79 00	3	0	0	14	0	0	0	0	0	0	1	3	5
79 25	4	0	0	14	0	0	0	0	0	0	1	3	5
79 50	1	0	0	14	0	0	0	0	0	0	1	3	5
79 75	10	0	0	14	0	0	0	0	0	0	1	3	5
80 00	11	0	0	14	0	0	0	0	0	0	1	3	5
80 25	20	0	0	14	0	0	0	0	0	0	1	3	5
80 50	3	0	0	14	0	0	0	0	0	0	1	3	5
80 75	0	0	0	14	0	0	0	0	0	0	1	3	5
81 00	0	0	0	14	0	0	0	0	0	0	1	3	5
81 25	0	0	0	14	0	0	0	0	0	0	1	3	5
81 50	0	0	0	14	0	0	0	0	0	0	1	3	5
81 75	0	0	0	14	0	0	0	0	0	0	1	3	5
82 00	0	0	0	14	0	0	0	0	0	0	1	3	5
82 25	0	0	0	14	0	0	0	0	0	0	1	3	5
82 50	0	0	0	14	0	0	0	0	0	0	1	3	5
82 75	0	0	0	14	0	0	0	0	0	0	1	3	5
83 00	0	0	0	14	0	0	0	0	0	0	1	3	5
83 25	0	0	0	14	0	0	0	0	0	0	1	3	5
83 50	0	0	0	14	0	0	0	0	0	0	1	3	5
83 75	0	0	0	14	0	0	0	0	0	0	1	3	5
84 00	0	0	0	14	0	0	0	0	0	0	1	3	5
84 25	0	0	0	14	0	0	0	0	0	0	1	3	5
84 50	0	0	0	14	0	0	0	0	0	0	1	3	5
84 75	0	0	0	14	0	0	0	0	0	0	1	3	5
85 00	0	0	0	14	0	0	0	0	0	0	1	3	5
85 25	0	0	0	14	0	0	0	0	0	0	1	3	5
85 50	0	0	0	14	0	0	0	0	0	0	1	3	5
85 75	0	0	0	14	0	0	0	0	0	0	1	3	5
86 00	4	0	0	14	0	0	0	0	0	0	1	3	5
86 25	2	0	0	14	0	0	0	0	0	0	1	3	5
86 50	9	0	0	14	0	0	0	0	0	0	1	3	5
86 75	2	0	0	14	0	0	0	0	0	0	1	3	5
87 00	0	0	0	14	0	0	0	0	0	0	1	3	5
87 25	0	0	0	14	0	0	0	0	0	0	1	3	5
87 50	0	0	0	14	0	0	0	0	0	0	1	3	5

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE	PATIENT						TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
87 75	0	0	0	14	0	0	0	0	0	0	1	3	5
88 00	0	0	0	14	0	0	0	0	0	0	1	3	5
88 25	0	0	0	14	0	0	0	0	0	0	1	3	5
88 50	0	0	0	14	0	0	0	0	0	0	1	3	5
88 75	0	0	0	14	0	0	0	0	0	0	1	3	5
89 00	0	0	0	14	0	0	0	0	0	0	1	3	5
89 25	0	0	0	14	0	0	0	0	0	0	1	3	5
89 50	0	0	0	14	0	0	0	0	0	0	1	3	5
89 75	0	0	0	14	0	0	0	0	0	0	1	3	5
90 00	0	0	0	14	0	0	0	0	0	0	1	3	5
90 25	0	0	0	14	0	0	0	0	0	0	1	3	5
90 50	0	0	0	14	0	0	0	0	0	0	1	3	5
90 75	0	0	0	14	0	0	0	0	0	0	1	3	5
91 00	0	0	0	14	0	0	0	0	0	0	1	3	5
91 25	0	0	0	14	0	0	0	0	0	0	1	3	5
91 50	1	0	0	14	0	0	0	0	0	0	1	3	5
91 75	0	0	0	14	0	0	0	0	0	0	1	3	5
92 00	0	0	0	14	0	0	0	0	0	0	1	3	5
92 25	0	0	0	14	0	0	0	0	0	0	1	3	5
92 50	0	0	0	14	0	0	0	0	0	0	1	3	5
92 75	0	0	0	14	0	0	0	0	0	0	1	3	5
93 00	0	0	0	14	0	0	0	0	0	0	1	3	5
93 25	0	0	0	14	0	0	0	0	0	0	1	3	5
93 50	0	0	0	14	0	0	0	0	0	0	1	3	5
93 75	0	0	0	14	0	0	0	0	0	0	1	3	5
94 00	3	0	0	14	0	0	0	0	0	0	1	3	5
94 25	1	0	0	14	0	0	0	0	0	0	1	3	5
94 50	0	0	0	14	0	0	0	0	0	0	1	3	5
94 75	0	0	0	14	0	0	0	0	0	0	1	3	5
95 00	0	0	0	14	0	0	0	0	0	0	1	3	5
95 25	0	0	0	14	0	0	0	0	0	0	1	3	5
95 50	0	0	0	14	0	0	0	0	0	0	1	3	5
95 75	0	0	0	14	0	0	0	0	0	0	1	3	5
96 00	0	0	0	14	0	0	0	0	0	0	1	3	5
96 25	0	0	0	14	0	0	0	0	0	0	1	3	5
96 50	0	0	0	14	0	0	0	0	0	0	1	3	5
96 75	0	0	0	14	0	0	0	0	0	0	1	3	5
97 00	0	0	0	14	0	0	0	0	0	0	1	3	5
97 25	2	0	0	14	0	0	0	0	0	0	1	3	5
97 50	3	0	0	14	0	0	0	0	0	0	1	3	5
97 75	5	0	0	14	0	0	0	0	0	0	1	3	5
98 00	6	0	0	14	0	0	0	0	0	0	1	3	5
98 25	2	0	0	14	0	0	0	0	0	0	1	3	5
98 50	0	0	0	14	0	0	0	0	0	0	1	3	5
98 75	4	0	0	14	0	0	0	0	0	0	1	3	5
99 00	0	0	0	14	0	0	0	0	0	0	1	3	5
99 25	0	0	0	14	0	0	0	0	0	0	1	3	5
99 50	0	0	0	14	0	0	0	0	0	0	1	3	5
99 75	0	0	0	14	0	0	0	0	0	0	1	3	5
100 00	0	0	0	14	0	0	0	0	0	0	1	3	5

UCSF7 TEAM 3, FEMALE-75, PROBE 10" FROM CONE, TOOTH IMPLANTATION-ANTERIOR MANDABLE

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
100 25	0	0	0	14	0	0	0	0	0	0	1	3	5

UCSF8 TEAM 3, FEMALE-49, EXTRACT LOWER RT BICUSBID/TUBEROSITY REDUCTION

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST.	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
0 25	0	0	0	11	0	0	0	0	0	0	2	3	4
0 50	0	0	0	11	0	0	0	0	0	0	2	3	4
0 75	0	0	0	11	0	0	0	0	0	0	2	3	4
1 00	0	0	0	11	0	0	0	0	0	0	2	3	4
1 25	0	0	0	11	0	0	0	0	0	0	2	3	4
1 50	0	0	0	11	0	0	0	0	0	0	2	3	4
1 75	0	0	0	11	0	0	0	0	0	0	2	3	4
2 00	0	0	0	11	0	0	0	0	0	0	2	3	4
2 25	0	0	0	11	0	0	0	0	0	0	2	3	4
2 50	0	0	0	11	0	0	0	0	0	0	2	3	4
2 75	0	0	0	11	0	0	0	0	0	0	2	3	4
3 00	0	0	0	11	0	0	0	0	0	0	2	3	4
3 25	0	0	0	11	0	0	0	0	0	0	2	3	4
3 50	0	0	0	11	0	0	0	0	0	0	2	3	4
3 75	0	0	0	11	0	0	0	0	0	0	2	3	4
4 00	0	0	0	11	0	0	0	0	0	0	2	3	4
4 25	0	0	0	11	0	0	0	0	0	0	2	3	4
4 50	0	0	0	11	0	0	0	0	0	0	2	3	4
4 75	0	0	0	11	0	0	0	0	0	0	2	3	4
5 00	0	0	0	11	0	0	0	0	0	0	2	3	4
5 25	0	0	0	11	0	0	0	0	0	0	2	3	4
5 50	0	0	0	11	0	0	0	0	0	0	2	3	4
5 75	0	0	0	11	0	0	0	0	0	0	2	3	4
6 00	0	0	0	11	0	0	0	0	0	0	2	3	4
6 25	0	0	0	11	0	0	0	0	0	0	2	3	4
6 50	0	0	0	11	0	0	0	0	0	0	2	3	4
6 75	0	0	0	11	0	0	0	0	0	0	2	3	4
7 00	0	0	0	11	0	0	0	0	0	0	2	3	4
7 25	0	0	0	11	0	0	0	0	0	0	2	3	4
7 50	0	0	0	11	0	0	0	0	0	0	2	3	4
7 75	0	0	0	11	0	0	0	0	0	0	2	3	4
8 00	0	0	0	11	0	0	0	0	0	0	2	3	4
8 25	0	0	0	11	0	0	0	0	0	0	2	3	4
8 50	0	0	0	11	0	0	0	0	0	0	2	3	4
8 75	0	0	0	11	0	0	0	0	0	0	2	3	4
9 00	0	0	0	11	0	0	0	0	0	0	2	3	4
9 25	0	0	0	11	0	0	0	0	0	0	2	3	4
9 50	0	0	0	11	0	0	0	0	0	0	2	3	4
9 75	0	0	0	11	0	0	0	0	0	0	2	3	4
10 00	0	0	0	11	0	0	0	0	0	0	2	3	4
10 25	0	0	0	11	0	0	0	0	0	0	2	3	4
10 50	0	0	0	11	0	0	0	0	0	0	2	3	4
10 75	0	0	0	11	0	0	0	0	0	0	2	3	4
11 00	0	0	0	11	0	0	0	0	0	0	2	3	4
11 25	0	0	0	11	0	0	0	0	0	0	2	3	4
11 50	0	0	0	11	0	0	0	0	0	0	2	3	4
11 75	0	0	0	11	0	0	0	0	0	0	2	3	4
12 00	0	0	0	11	0	0	0	0	0	0	2	3	4
12 25	0	0	0	11	0	0	0	0	0	0	2	3	4
12 50	0	0	0	11	0	0	0	0	0	0	2	3	4

UCSF8 TEAM 3, FEMALE-49, EXTRACT LOWER RT BICUSBID/TUBEROSITY REDUCTION

TIME	CONC	N20	PULL	PROBE	PATIENT						TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
12 75	0	0	0	11	0	0	0	0	0	0	2	3	4
13 00	0	0	0	11	0	0	0	0	0	0	2	3	4
13 25	0	0	0	11	0	0	0	0	0	0	2	3	4
13 50	0	0	0	11	0	0	0	0	0	0	2	3	4
13 75	0	0	0	11	0	0	0	0	0	0	2	3	4
14 00	0	0	0	11	0	0	0	0	0	0	2	3	4
14 25	0	0	0	11	0	0	0	0	0	0	2	3	4
14 50	0	0	0	11	0	0	0	0	0	0	2	3	4
14 75	0	0	0	11	0	0	0	0	0	0	2	3	4
15 00	0	0	0	11	0	0	0	0	0	0	2	3	4
15 25	0	0	0	11	0	0	0	0	0	0	2	3	4
15 50	0	0	0	11	0	0	0	0	0	0	2	3	4
15 75	0	0	0	11	0	0	0	0	0	0	2	3	4
16 00	0	0	0	11	0	0	0	0	0	0	2	3	4
16 25	0	0	0	11	0	0	0	0	0	0	2	3	4
16 50	0	0	0	11	0	0	0	0	0	0	2	3	4
16 75	0	0	0	11	0	0	0	0	0	0	2	3	4
17 00	0	33	0	11	0	0	0	0	0	0	2	3	4
17 25	8	33	0	11	0	0	0	0	0	0	2	3	4
17 50	46	33	0	11	0	0	0	0	0	0	2	3	4
17 75	3	33	0	11	0	0	0	1	0	0	2	3	4
18 00	1	33	0	11	0	0	0	1	0	0	2	3	4
18 25	0	33	0	11	0	0	0	0	0	0	2	3	4
18 50	1	33	0	11	0	0	0	1	0	0	2	3	4
18 75	1	33	0	11	0	0	0	0	0	0	2	3	4
19 00	1	33	0	11	0	0	0	0	0	0	2	3	4
19 25	1	33	0	11	0	0	0	0	0	0	2	3	4
19 50	5	33	0	11	0	0	0	0	0	1	2	3	4
19 75	8	33	0	11	0	0	0	0	0	1	2	3	4
20 00	5	33	0	11	0	0	0	0	0	0	2	3	4
20 25	6	33	0	11	0	0	0	0	0	0	2	3	4
20 50	9	33	0	11	0	0	0	0	0	0	2	3	4
20 75	6	33	0	11	0	0	0	0	0	0	2	3	4
21 00	115	33	0	11	0	0	0	0	0	0	2	3	4
21 25	31	33	0	11	0	0	0	0	0	0	2	3	4
21 50	8	33	0	11	0	0	0	0	0	0	2	3	4
21 75	9	33	0	11	0	0	0	0	0	0	2	3	4
22 00	10	33	0	11	0	0	0	0	0	0	2	3	4
22 25	8	33	0	11	0	0	0	0	0	0	2	3	4
22 50	13	33	0	11	0	0	0	0	0	0	2	3	4
22 75	6	33	0	11	0	0	0	0	0	1	2	3	4
23 00	8	33	0	11	0	0	0	0	0	0	2	3	4
23 25	9	33	0	11	0	0	0	0	0	0	2	3	4
23 50	6	33	0	11	0	0	0	0	0	0	2	3	4
23 75	7	33	0	11	0	0	0	1	0	0	2	3	4
24 00	5	33	0	11	0	0	0	0	0	0	2	3	4
24 25	5	33	0	11	0	0	0	0	0	0	2	3	4
24 50	56	33	0	11	0	0	0	0	0	0	2	3	4
24 75	40	33	0	7	0	0	0	0	0	0	2	3	4
25 00	39	33	0	7	0	0	0	0	0	0	2	3	4

UCSF8 TEAM 3, FEMALE-49, EXTRACT LOWER RT BICUSBID/TUBEROSITY REDUCTION

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
25 25	146	33	0	7	0	0	0	0	0	0	2	3	4
25 50	68	33	0	7	0	0	0	0	0	0	2	3	4
25 75	25	33	0	7	0	0	0	0	0	0	2	3	4
26 00	119	33	0	7	0	0	0	0	0	0	2	3	4
26 25	125	33	0	7	0	0	0	0	0	0	2	3	4
26 50	255	33	0	7	0	0	0	1	0	0	2	3	4
26 75	164	33	0	7	0	0	0	1	0	0	2	3	4
27 00	107	33	0	7	0	0	0	1	0	0	2	3	4
27 25	97	33	0	7	0	0	0	0	0	1	2	3	4
27 50	97	33	0	7	0	0	0	0	0	0	2	3	4
27 75	115	33	0	7	0	0	0	0	0	0	2	3	4
28 00	91	33	0	7	0	0	0	0	0	1	2	3	4
28 25	62	33	0	7	0	0	0	0	0	1	2	3	4
28 50	138	33	0	7	1	0	0	0	0	0	2	3	4
28 75	56	33	0	7	1	0	0	0	0	0	2	3	4
29 00	116	33	0	7	0	0	0	0	0	0	2	3	4
29 25	68	33	0	7	1	0	0	0	0	0	2	3	4
29 50	9	33	0	7	1	0	0	0	0	0	2	3	4
29 75	33	33	0	7	1	0	0	0	0	0	2	3	4
30 00	66	33	0	7	1	0	0	0	0	0	2	3	4
30 25	66	33	0	7	1	0	0	0	0	0	2	3	4
30 50	117	33	0	7	1	0	0	0	0	0	2	3	4
30 75	92	33	0	7	1	0	0	0	0	0	2	3	4
31 00	182	33	0	7	0	0	0	0	0	0	2	3	4
31 25	303	33	0	7	1	0	0	0	0	0	2	3	4
31 50	113	33	0	7	1	0	0	0	0	0	2	3	4
31 75	165	33	0	7	0	0	0	0	0	0	2	3	4
32 00	201	33	0	7	0	0	0	0	0	0	2	3	4
32 25	195	33	0	7	0	0	0	0	0	0	2	3	4
32 50	105	33	0	7	0	0	0	0	0	0	2	3	4
32 75	59	33	0	7	0	0	0	0	0	0	2	3	4
33 00	50	33	0	7	0	0	0	0	0	0	2	3	4
33 25	145	33	0	7	0	0	0	0	0	0	2	3	4
33 50	135	33	0	7	0	0	0	0	0	0	2	3	4
33 75	482	33	1	7	0	0	0	0	0	0	2	3	4
34 00	113	33	1	7	0	0	0	0	0	0	2	3	4
34 25	118	33	1	7	0	0	0	0	0	0	2	3	4
34 50	97	33	1	7	0	1	0	0	0	0	2	3	4
34 75	308	33	1	7	0	1	0	0	0	0	2	3	4
35 00	286	33	0	7	0	1	0	0	0	0	2	3	4
35 25	303	33	0	7	0	1	0	0	0	0	2	3	4
35 50	258	33	0	7	0	1	0	0	0	1	2	3	4
35 75	257	33	0	7	0	1	0	0	0	0	2	3	4
36 00	215	0	1	7	0	1	0	0	0	0	2	3	4
36 25	104	0	1	7	0	1	0	0	0	0	2	3	4
36 50	73	0	1	7	0	1	0	0	0	0	2	3	4
36 75	76	0	1	7	0	1	0	0	0	0	2	3	4
37 00	51	0	1	7	0	1	0	0	0	0	2	3	4
37 25	21	0	1	7	0	1	0	0	0	0	2	3	4
37 50	29	0	1	7	0	1	0	1	0	0	2	3	4

UCSF8 TEAM 3, FEMALE-49, EXTRACT LOWER RT BICUSBID/TUBEROSITY REDUCTION

TIME	CONC	N20	PULL	PROBE	PATIENT						TYPE	DENT	
MIN	PPM	%	POKE	DIST.	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
37 75	34	0	1	7	0	1	0	1	0	0	2	3	4
38 00	34	0	1	7	0	1	0	1	0	0	2	3	4
38 25	27	0	1	7	0	1	0	1	0	0	2	3	4
38 50	29	0	1	7	0	1	0	1	0	0	2	3	4
38 75	15	0	1	7	0	1	0	1	0	0	2	3	4
39 00	32	0	1	7	0	1	0	1	0	0	2	3	4
39 25	18	0	1	7	0	1	0	1	0	0	2	3	4
39 50	5	0	1	7	0	1	0	1	0	0	2	3	4
39 75	18	0	0	7	0	1	0	1	0	0	2	3	4
40 00	50	0	0	7	0	1	0	1	0	0	2	3	4
40 25	24	0	0	7	0	1	0	1	0	0	2	3	4
40 50	11	0	0	7	0	1	0	1	0	0	2	3	4
40 75	10	0	0	7	0	1	0	0	0	0	2	3	4
41 00	3	0	0	7	0	1	0	1	1	0	2	3	4
41 25	31	0	0	7	0	1	0	1	1	0	2	3	4
41 50	21	0	0	7	0	1	0	1	0	1	2	3	4
41 75	8	0	0	7	0	1	0	1	0	1	2	3	4
42 00	9	0	0	7	0	1	0	1	0	1	2	3	4
42 25	6	0	0	7	0	1	1	1	0	1	2	3	4
42 50	4	0	0	7	0	1	1	1	0	1	2	3	4
42 75	0	0	0	7	0	1	0	1	0	0	2	3	4
43 00	0	0	0	7	0	1	0	1	0	0	2	3	4
43 25	7	0	0	7	0	1	0	1	0	0	2	3	4
43 50	1	0	0	7	0	1	0	1	0	1	2	3	4
43 75	53	0	0	7	0	1	0	1	0	1	2	3	4
44 00	16	0	0	7	0	1	0	1	0	1	2	3	4
44 25	45	0	0	7	0	1	0	1	1	1	2	3	4
44 50	60	0	0	7	0	1	0	1	1	1	2	3	4
44 75	37	0	0	7	0	1	0	1	1	1	2	3	4
45 00	23	0	0	7	0	1	0	1	1	1	2	3	4
45 25	34	0	0	7	0	1	0	1	0	1	2	3	4
45 50	28	0	0	7	0	1	0	1	0	1	2	3	4
45 75	29	0	0	7	0	1	0	1	0	1	2	3	4
46 00	12	0	0	7	0	1	0	1	0	1	2	3	4
46 25	1	0	0	7	0	1	0	1	0	1	2	3	4
46 50	0	0	0	7	0	1	0	1	0	1	2	3	4
46 75	0	0	0	7	0	1	0	1	0	1	2	3	4
47 00	1	0	0	7	0	1	0	1	0	1	2	3	4
47 25	3	0	0	7	0	1	0	1	0	1	2	3	4
47 50	19	0	0	7	0	1	0	1	0	0	2	3	4
47 75	3	0	1	7	0	1	0	1	0	0	2	3	4
48 00	0	0	1	7	0	1	0	1	0	0	2	3	4
48 25	2	0	1	7	0	1	0	1	0	0	2	3	4
48 50	1	0	1	7	0	1	0	1	0	0	2	3	4
48 75	8	0	1	7	0	1	0	1	0	0	2	3	4
49 00	1	0	1	7	0	1	0	1	0	0	2	3	4
49 25	1	0	1	7	0	1	0	1	0	0	2	3	4
49 50	3	0	1	7	0	1	0	1	0	0	2	3	4
49 75	1	0	1	7	0	1	0	1	0	0	2	3	4
50 00	0	0	1	7	0	1	0	1	0	0	2	3	4

UCSF8 TEAM 3, FEMALE-49, EXTRACT LOWER RT BICUSBID/TUBEROSITY REDUCTION

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
50 25	1	0	1	7	0	1	0	1	0	0	2	3	4
50 50	13	0	1	7	0	1	0	1	0	0	2	3	4
50 75	3	0	1	7	0	1	0	1	0	0	2	3	4
51 00	5	0	1	7	0	1	0	1	0	0	2	3	4
51 25	7	0	1	7	0	1	0	1	0	0	2	3	4
51 50	11	0	1	7	0	1	0	1	0	0	2	3	4
51 75	10	0	1	7	0	1	0	1	0	0	2	3	4
52 00	2	0	1	7	0	1	0	1	0	0	2	3	4
52 25	0	0	1	7	0	1	0	1	0	0	2	3	4
52 50	0	0	1	7	0	1	0	1	0	0	2	3	4
52 75	1	0	1	7	0	1	0	1	0	0	2	3	4
53 00	5	0	1	7	0	1	0	1	0	0	2	3	4
53 25	8	0	1	7	0	1	0	1	0	0	2	3	4
53 50	2	0	1	7	0	1	0	1	0	0	2	3	4
53 75	1	0	1	7	0	1	0	1	0	0	2	3	4
54 00	1	0	1	7	0	1	0	1	0	0	2	3	4
54 25	1	0	1	7	0	1	0	1	0	0	2	3	4
54 50	0	0	1	7	0	1	0	1	1	0	2	3	4
54 75	6	0	1	7	0	1	0	1	0	0	2	3	4
55 00	3	0	1	7	0	1	0	1	0	0	2	3	4
55 25	0	0	1	7	0	1	0	1	0	0	2	3	4
55 50	0	0	1	7	0	1	0	1	0	0	2	3	4
55 75	0	0	1	7	0	1	0	1	0	0	2	3	4
56 00	0	0	1	7	0	1	0	1	0	0	2	3	4
56 25	3	0	1	7	0	1	0	1	0	0	2	3	4
56 50	1	0	1	7	0	1	0	1	0	0	2	3	4
56 75	0	0	1	7	0	1	1	1	0	0	2	3	4
57 00	1	0	1	7	0	1	0	1	0	0	2	3	4
57 25	0	0	1	7	0	1	0	1	0	0	2	3	4
57 50	0	0	1	7	0	1	0	1	0	0	2	3	4
57 75	2	0	1	7	0	1	0	1	0	0	2	3	4
58 00	2	0	1	7	0	1	0	1	0	0	2	3	4
58 25	0	0	1	7	0	1	0	1	0	0	2	3	4
58 50	1	0	1	7	0	1	0	1	0	0	2	3	4
58 75	0	0	1	7	0	1	0	1	0	0	2	3	4
59 00	0	0	1	7	0	1	0	1	0	0	2	3	4
59 25	2	0	1	7	0	1	0	1	0	0	2	3	4
59 50	0	0	0	7	0	0	0	1	0	1	2	3	4
59 75	7	0	0	7	0	0	0	1	0	1	2	3	4
60 00	15	0	0	7	0	0	0	1	0	1	2	3	4
60 25	5	0	0	7	0	0	0	1	0	1	2	3	4
60 50	1	0	0	7	0	0	0	1	0	1	2	3	4
60 75	1	0	0	7	0	0	0	1	0	1	2	3	4
61 00	0	0	0	7	0	0	0	1	0	1	2	3	4
61 25	0	0	0	7	0	0	0	1	0	1	2	3	4
61 50	0	0	0	7	0	0	0	1	0	1	2	3	4
61 75	2	0	0	7	0	0	0	1	0	1	2	3	4
62 00	1	0	0	7	0	0	0	1	0	1	2	3	4
62 25	0	0	0	7	0	0	0	1	0	1	2	3	4

UCSF9 TEAM 3, FEMALE-20, REMOVE-4 WISDOM TEETH

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
0 20	0	0	0	13	0	0	0	0	0	1	1	2	1
0 40	0	0	0	13	0	0	0	0	0	0	1	2	1
0 60	0	0	0	13	0	0	0	0	0	1	1	2	1
0 80	0	0	0	13	0	0	0	0	0	0	1	2	1
1 00	0	0	0	13	0	0	0	1	0	0	1	2	1
1 20	0	0	0	13	0	0	0	1	0	0	1	2	1
1 40	0	0	0	13	0	0	0	0	0	0	1	2	1
1 60	0	0	0	13	0	0	0	0	0	0	1	2	1
1 80	0	0	0	13	0	0	0	0	0	0	1	2	1
2 00	0	0	0	13	0	0	0	0	0	0	1	2	1
2 20	0	0	0	13	0	0	0	0	0	0	1	2	1
2 40	0	0	0	13	0	0	0	0	0	0	1	2	1
2 60	0	33	0	13	0	0	0	0	0	0	1	2	1
2 80	0	33	0	13	0	0	0	0	0	0	1	2	1
3 00	0	33	0	13	0	0	0	0	0	0	1	2	1
3 20	0	33	0	13	0	0	0	0	0	0	1	2	1
3 40	0	33	0	13	0	0	0	0	0	1	1	2	1
3 60	0	33	0	13	0	0	0	0	0	1	1	2	1
3 80	0	33	0	13	0	0	0	0	0	1	1	2	1
4 00	0	33	0	13	0	0	0	0	0	0	1	2	1
4 20	0	33	0	13	0	0	0	1	0	0	1	2	1
4 40	0	33	0	13	0	0	0	0	0	0	1	2	1
4 60	0	33	0	13	0	0	0	0	0	0	1	2	1
4 80	0	33	0	13	0	0	0	0	0	0	1	2	1
5 00	0	50	0	13	0	0	0	0	0	0	1	2	1
5 20	1	50	0	13	0	0	0	0	0	0	1	2	1
5 40	3	50	0	13	0	0	0	0	0	0	1	2	1
5 60	8	50	0	13	0	0	0	0	0	0	1	2	1
5 80	7	50	0	11	0	0	0	0	0	1	1	2	1
6 00	4	50	0	11	0	0	0	0	0	1	1	2	1
6 20	2	50	0	11	0	0	0	0	0	0	1	2	1
6 40	2	50	0	11	0	0	0	0	0	0	1	2	1
6 60	1	50	0	11	0	0	0	0	0	0	1	2	1
6 80	1	50	0	11	0	0	0	0	0	0	1	2	1
7 00	1	50	0	11	0	0	0	0	0	0	1	2	1
7 20	1	50	0	11	0	0	0	0	0	1	1	2	1
7 40	1	50	0	11	0	0	0	0	0	0	1	2	1
7 60	0	50	0	11	0	0	0	0	0	0	1	2	1
7 80	0	50	0	11	0	0	0	0	0	1	1	2	1
8 00	43	50	0	11	0	0	0	0	0	1	1	2	1
8 20	66	50	0	11	0	0	0	0	0	0	1	2	1
8 40	22	50	0	11	0	0	0	0	0	0	1	2	1
8 60	10	50	0	11	0	0	0	0	0	0	1	2	1
8 80	24	50	0	11	0	0	0	0	0	0	1	2	1
9 00	38	50	0	11	0	0	0	0	0	0	1	2	1
9 20	20	50	0	11	0	0	0	0	0	0	1	2	1
9 40	8	50	0	11	0	0	0	0	0	0	1	2	1
9 60	23	50	0	11	0	0	0	0	0	0	1	2	1
9 80	23	50	0	11	0	0	0	0	0	0	1	2	1
10 00	6	50	0	11	0	0	0	0	0	0	1	2	1

UCSF9 TEAM 3, FEMALE-20, REMOVE-4 WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
10 20	15	50	1	11	0	0	0	0	0	1	1	2	1
10 40	21	50	1	10	1	0	0	0	0	1	1	2	1
10 60	5	50	0	10	1	0	0	0	0	0	1	2	1
10 80	2	50	1	10	0	0	0	0	0	0	1	2	1
11 00	1	50	1	10	0	0	0	0	0	0	1	2	1
11 20	2	50	0	10	0	0	0	0	0	0	1	2	1
11 40	7	50	0	10	0	0	0	0	0	1	1	2	1
11 60	12	50	0	10	0	0	0	0	0	1	1	2	1
11 80	11	50	0	10	0	0	0	0	0	0	1	2	1
12 00	7	50	0	10	0	0	0	0	0	0	1	2	1
12 20	8	50	0	10	0	0	0	0	0	0	1	2	1
12 40	5	50	0	10	0	0	0	0	0	0	1	2	1
12 60	2	50	0	10	0	0	0	0	0	0	1	2	1
12 80	5	50	0	10	0	0	0	0	0	0	1	2	1
13 00	14	50	0	10	1	0	0	0	0	0	1	2	1
13 20	30	50	0	10	1	0	0	0	0	0	1	2	1
13 40	18	50	0	10	1	0	0	0	0	0	1	2	1
13 60	14	50	0	10	1	0	0	0	0	0	1	2	1
13 80	6	50	0	10	1	0	0	0	0	0	1	2	1
14 00	3	50	0	10	1	0	0	0	0	0	1	2	1
14 20	2	50	0	10	1	0	0	0	0	0	1	2	1
14 40	6	50	0	10	1	0	0	0	0	0	1	2	1
14 60	18	50	0	10	1	0	0	0	0	0	1	2	1
14 80	13	50	0	10	1	0	0	0	0	0	1	2	1
15 00	12	50	0	10	1	0	0	0	0	0	1	2	1
15 20	14	50	0	10	1	1	0	0	0	0	1	2	1
15 40	12	50	0	10	1	0	0	0	0	0	1	2	1
15 60	11	50	0	10	1	0	0	0	0	0	1	2	1
15 80	39	50	0	10	1	0	0	0	0	0	1	2	1
16 00	46	50	0	10	0	0	0	0	0	0	1	2	1
16 20	46	50	0	10	1	0	0	0	0	0	1	2	1
16 40	14	50	0	10	0	1	0	0	0	0	1	2	1
16 60	14	50	0	10	1	0	0	0	0	0	1	2	1
16 80	38	50	0	10	1	0	0	0	0	0	1	2	1
17 00	29	50	0	10	0	0	0	0	0	0	1	2	1
17 20	14	50	0	10	0	0	0	0	0	0	1	2	1
17 40	37	50	0	10	0	0	0	0	0	0	1	2	1
17 60	60	50	0	10	0	0	0	0	0	0	1	2	1
17 80	239	50	0	10	0	0	0	0	0	0	1	2	1
18 00	108	50	1	10	0	1	0	0	0	0	1	2	1
18 20	28	50	1	10	0	1	0	0	0	0	1	2	1
18 40	4	50	1	10	0	1	0	0	0	0	1	2	1
18 60	1	50	1	10	0	1	0	0	0	0	1	2	1
18 80	2	50	1	10	0	1	0	0	0	0	1	2	1
19 00	3	50	1	10	0	1	0	0	0	0	1	2	1
19 20	2	50	1	10	0	1	0	0	0	0	1	2	1
19 40	2	50	1	10	0	1	0	0	0	0	1	2	1
19 60	6	50	1	10	0	1	0	0	0	0	1	2	1
19 80	10	50	1	10	0	1	0	0	0	0	1	2	1
20 00	8	50	1	10	0	1	0	0	0	0	1	2	1

UCSF9 TEAM 3, FEMALE-20, REMOVE-4 WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
20 20	3	50	1	10	0	1	0	0	0	0	1	2	1
20 40	2	50	1	10	0	1	0	0	0	0	1	2	1
20 60	10	50	1	10	0	1	0	0	0	0	1	2	1
20 80	22	50	1	10	0	1	0	0	0	0	1	2	1
21 00	9	50	1	10	0	1	0	0	0	0	1	2	1
21 20	47	50	1	10	0	1	0	0	0	0	1	2	1
21 40	78	50	1	10	0	1	0	0	0	0	1	2	1
21 60	23	50	1	10	0	1	0	0	0	0	1	2	1
21 80	4	50	1	10	0	1	0	0	0	0	1	2	1
22 00	1	50	1	10	0	1	0	0	0	0	1	2	1
22 20	4	50	1	10	0	1	0	0	0	0	1	2	1
22 40	15	50	1	10	0	1	0	0	0	0	1	2	1
22 60	31	50	1	10	0	1	0	0	0	0	1	2	1
22 80	45	50	1	10	0	1	0	0	0	0	1	2	1
23 00	54	50	1	10	0	1	0	0	0	0	1	2	1
23 20	51	50	1	10	0	1	0	0	0	0	1	2	1
23 40	47	50	1	10	0	1	0	0	0	0	1	2	1
23 60	55	50	1	10	0	1	0	0	0	0	1	2	1
23 80	57	50	1	10	0	1	0	0	0	0	1	2	1
24 00	81	50	1	10	0	1	0	0	0	0	1	2	1
24 20	131	50	1	10	0	1	0	0	0	0	1	2	1
24 40	87	50	1	10	0	1	0	0	0	0	1	2	1
24 60	67	50	1	10	0	1	0	0	0	0	1	2	1
24 80	46	50	1	10	0	1	0	0	0	0	1	2	1
25 00	40	50	1	10	0	1	0	0	0	0	1	2	1
25 20	56	50	1	10	0	1	0	0	0	0	1	2	1
25 40	32	50	1	10	0	1	0	0	0	0	1	2	1
25 60	12	50	1	10	0	1	0	0	0	0	1	2	1
25 80	37	50	1	10	0	1	0	0	0	0	1	2	1
26 00	108	50	1	10	0	1	0	0	0	0	1	2	1
26 20	63	50	1	10	0	1	0	0	0	0	1	2	1
26 40	17	50	1	10	0	1	0	0	0	0	1	2	1
26 60	39	50	1	10	0	1	0	0	0	1	1	2	1
26 80	19	50	0	10	0	1	0	0	0	1	1	2	1
27 00	12	50	0	10	0	1	0	0	0	1	1	2	1
27 20	6	50	0	10	0	1	0	0	0	1	1	2	1
27 40	11	50	0	10	0	1	0	0	0	1	1	2	1
27 60	17	50	0	10	0	1	0	0	0	1	1	2	1
27 80	14	50	0	10	0	1	0	0	0	1	1	2	1
28 00	13	50	0	10	0	1	0	0	0	1	1	2	1
28 20	7	50	0	10	0	1	0	0	0	1	1	2	1
28 40	5	50	0	10	0	1	0	0	0	1	1	2	1
28 60	6	50	0	10	0	1	0	0	0	1	1	2	1
28 80	8	50	0	10	0	1	0	0	0	1	1	2	1
29 00	20	50	0	10	0	1	0	0	0	1	1	2	1
29 20	13	50	0	10	0	1	0	0	0	1	1	2	1
29 40	28	50	0	10	0	1	0	0	0	1	1	2	1
29 60	27	50	0	10	0	1	0	0	0	1	1	2	1
29 80	14	50	0	10	0	1	0	0	0	1	1	2	1
30 00	16	50	0	10	0	1	0	0	0	1	1	2	1

UCSF9 TEAM 3, FEMALE-20, REMOVE-4 WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
30 20	9	50	0	10	0	1	0	0	0	1	1	2	1
30 40	26	50	1	10	0	1	0	0	0	0	1	2	1
30 60	61	50	1	10	0	1	0	0	0	0	1	2	1
30 80	39	50	1	10	0	1	0	0	0	0	1	2	1
31 00	73	50	1	10	0	1	0	0	0	0	1	2	1
31 20	35	50	1	10	0	1	0	0	0	0	1	2	1
31 40	34	50	1	10	0	1	0	0	0	0	1	2	1
31 60	17	50	1	10	0	1	0	0	0	0	1	2	1
31 80	18	50	1	10	0	1	0	0	0	0	1	2	1
32 00	20	50	1	10	0	1	0	0	0	0	1	2	1
32 20	25	50	1	10	0	1	0	0	0	0	1	2	1
32 40	14	50	1	10	0	1	0	0	0	0	1	2	1
32 60	8	50	1	10	0	1	0	0	0	0	1	2	1
32 80	9	50	1	10	0	1	0	0	0	0	1	2	1
33 00	11	50	1	10	0	1	0	0	0	1	1	2	1
33 20	6	50	0	10	0	1	0	0	0	1	1	2	1
33 40	5	50	0	10	0	1	0	0	0	1	1	2	1
33 60	4	50	0	10	0	1	0	0	0	1	1	2	1
33 80	6	50	0	10	0	1	0	0	0	1	1	2	1
34 00	20	50	0	10	0	1	0	0	0	1	1	2	1
34 20	14	50	0	10	0	1	0	0	0	1	1	2	1
34 40	9	50	0	10	0	1	0	0	0	1	1	2	1
34 60	54	50	0	10	0	1	0	0	0	1	1	2	1
34 80	58	50	0	10	0	1	0	0	0	1	1	2	1
35 00	23	50	0	10	0	1	0	0	0	1	1	2	1
35 20	37	50	0	10	0	1	0	0	0	1	1	2	1
35 40	14	50	0	10	0	1	0	0	0	1	1	2	1
35 60	11	50	1	10	0	1	0	0	0	0	1	2	1
35 80	41	50	1	10	0	1	0	0	0	0	1	2	1
36 00	10	50	1	10	0	1	0	0	0	0	1	2	1
36 20	2	50	1	10	0	1	0	0	0	0	1	2	1
36 40	26	50	0	10	0	1	0	0	0	0	1	2	1
36 60	45	50	0	10	0	1	1	0	1	0	1	2	1
36 80	91	50	0	10	0	1	1	0	1	0	1	2	1
37 00	46	50	0	10	0	1	1	0	1	0	1	2	1
37 20	94	50	0	10	0	1	1	0	1	0	1	2	1
37 40	140	50	0	10	0	1	1	0	1	0	1	2	1
37 60	143	50	0	10	0	1	1	0	1	0	1	2	1
37 80	110	50	0	10	0	1	1	0	1	0	1	2	1
38 00	80	50	1	10	0	1	0	0	0	0	1	2	1
38 20	44	50	1	10	0	1	0	0	0	0	1	2	1
38 40	52	50	1	10	0	1	0	0	0	0	1	2	1
38 60	54	50	1	10	0	1	0	0	0	0	1	2	1
38 80	63	50	1	10	0	1	0	0	0	0	1	2	1
39 00	53	50	1	10	0	1	0	0	0	0	1	2	1
39 20	69	50	1	10	0	1	0	0	0	0	1	2	1
39 40	53	50	1	10	0	1	0	0	0	0	1	2	1
39 60	71	50	1	10	0	1	0	0	0	0	1	2	1
39 80	40	50	1	10	0	1	1	0	0	0	1	2	1
40 00	46	50	1	10	0	1	1	0	0	1	1	2	1

UCSF9 TEAM 3, FEMALE-20, REMOVE-4 WISDOM TEETH

TIME MIN	CONC PPM	N20 %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
40 20	79	50	0	10	0	1	0	0	0	1	1	2	1
40 40	39	50	0	10	0	1	0	0	0	1	1	2	1
40 60	16	50	0	10	0	1	0	0	0	1	1	2	1
40 80	48	50	0	10	0	1	0	0	0	1	1	2	1
41 00	19	50	0	10	0	1	0	0	0	0	1	2	1
41 20	35	50	1	10	0	1	0	0	0	0	1	2	1
41 40	28	50	1	10	0	1	0	0	0	0	1	2	1
41 60	23	50	1	10	0	1	0	0	0	0	1	2	1
41 80	11	50	1	10	0	1	0	0	0	0	1	2	1
42 00	12	50	1	10	0	1	0	0	0	0	1	2	1
42 20	80	50	0	10	0	1	1	0	1	0	1	2	1
42 40	53	50	0	10	0	1	1	0	1	0	1	2	1
42 60	20	50	0	10	0	1	1	0	1	0	1	2	1
42 80	7	50	0	10	0	1	1	0	1	0	1	2	1
43 00	19	50	0	10	0	1	1	0	1	0	1	2	1
43 20	142	50	1	10	0	1	0	0	0	0	1	2	1
43 40	213	50	1	10	0	1	0	0	0	0	1	2	1
43 60	134	50	1	10	0	1	0	0	0	0	1	2	1
43 80	107	50	1	10	0	1	1	0	0	0	1	2	1
44 00	42	50	1	10	0	1	1	0	0	0	1	2	1
44 20	63	50	0	10	0	1	0	0	0	1	1	2	1
44 40	90	50	0	10	0	1	0	0	0	1	1	2	1
44 60	20	50	0	10	0	1	0	0	0	1	1	2	1
44 80	7	50	0	10	0	1	0	0	0	1	1	2	1
45 00	12	50	0	10	0	1	0	0	0	1	1	2	1
45 20	27	50	0	10	0	1	0	0	0	1	1	2	1
45 40	57	50	0	10	0	1	0	0	0	1	1	2	1
45 60	56	50	0	10	0	1	0	0	0	1	1	2	1
45 80	57	50	0	10	0	1	0	0	0	1	1	2	1
46 00	13	50	0	10	0	1	0	0	0	1	1	2	1
46 20	6	50	0	10	0	1	0	0	0	1	1	2	1
46 40	9	50	0	10	0	1	0	0	0	1	1	2	1
46 60	5	50	0	10	0	1	0	0	0	1	1	2	1
46 80	6	50	0	10	0	1	0	0	0	1	1	2	1
47 00	5	50	0	10	0	1	0	0	0	1	1	2	1
47 20	8	50	0	10	0	1	0	0	0	1	1	2	1
47 40	24	50	0	10	0	1	0	0	0	1	1	2	1
47 60	81	50	0	10	0	0	0	0	0	1	1	2	1
47 80	78	50	0	10	0	0	0	0	0	1	1	2	1
48 00	73	50	0	10	0	0	0	0	0	1	1	2	1
48 20	71	50	0	10	0	0	0	0	0	1	1	2	1
48 40	65	0	0	10	0	0	0	0	0	1	1	2	1
48 60	17	0	0	10	0	0	0	0	0	0	1	2	1
48 80	5	0	0	10	0	0	0	0	0	0	1	2	1
49 00	2	0	0	10	0	0	0	0	0	1	1	2	1
49 20	6	0	0	10	0	0	0	0	0	0	1	2	1
49 40	5	0	0	10	0	0	0	0	0	0	1	2	1
49 60	3	0	0	10	0	0	0	0	0	0	1	2	1
49 80	4	0	0	10	0	0	0	0	0	0	1	2	1
50 00	4	0	0	10	0	0	0	0	0	0	1	2	1

UCSF9 TEAM 3, FEMALE-20, REMOVE-4 WISDOM TEETH

TIME	CONC	N20	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
50 20	4	0	0	10	0	0	0	0	0	0	1	2	1
50 40	2	0	0	10	0	0	0	0	0	0	1	2	1
50 60	5	0	0	10	0	0	0	0	0	0	1	2	1
50 80	6	0	0	10	0	0	0	0	0	0	1	2	1
51 00	5	0	0	10	0	0	0	0	0	0	1	2	1
51 20	4	0	0	10	0	0	0	0	0	0	1	2	1
51 40	1	0	0	10	0	0	0	0	0	0	1	2	1

UCSF10 TEAM 2, FEMALE-24, REMOVE-2 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
0 25	22	0	0	13	0	0	0	0	0	0	1	2	2
0 50	59	0	0	13	0	0	0	0	0	0	1	2	2
0 75	116	0	0	13	0	0	0	0	0	0	1	2	2
1 00	91	0	0	13	0	0	0	0	0	0	1	2	2
1 25	107	0	0	13	0	0	0	0	0	0	1	2	2
1 50	35	0	0	13	0	0	0	0	0	0	1	2	2
1 75	33	0	0	13	0	0	0	1	0	0	1	2	2
2 00	54	0	0	13	0	0	0	0	0	0	1	2	2
2 25	62	0	0	13	0	0	0	0	0	0	1	2	2
2 50	56	0	0	13	0	0	0	0	0	0	1	2	2
2 75	32	0	0	13	0	0	0	0	0	0	1	2	2
3 00	20	0	0	13	0	0	0	0	0	0	1	2	2
3 25	23	0	0	13	0	0	0	0	0	0	1	2	2
3 50	18	0	0	13	0	0	0	0	0	1	1	2	2
3 75	32	0	0	13	0	0	0	0	0	0	1	2	2
4 00	68	0	0	13	0	0	0	0	0	0	1	2	2
4 25	19	0	0	13	0	0	0	0	0	0	1	2	2
4 50	10	0	0	13	0	0	0	0	0	0	1	2	2
4 75	9	50	0	13	0	0	0	0	0	0	1	2	2
5 00	128	50	0	13	0	0	0	0	0	0	1	2	2
5 25	179	50	0	11	0	0	0	0	0	1	1	2	2
5 50	101	50	0	11	0	0	0	0	0	0	1	2	2
5 75	39	50	0	11	0	0	0	0	0	0	1	2	2
6 00	59	50	0	11	0	0	0	0	0	0	1	2	2
6 25	114	50	0	11	0	0	0	0	0	0	1	2	2
6 50	45	50	0	11	0	0	0	0	0	0	1	2	2
6 75	271	50	1	11	0	0	0	0	0	0	1	2	2
7 00	215	50	1	11	0	0	0	0	0	0	1	2	2
7 25	94	50	1	11	0	0	0	0	0	0	1	2	2
7 50	28	50	0	11	0	0	0	0	0	0	1	2	2
7 75	9	50	0	11	0	0	0	0	0	0	1	2	2
8 00	6	50	0	11	0	0	0	0	0	0	1	2	2
8 25	6	50	0	11	0	0	0	0	0	0	1	2	2
8 50	65	50	0	11	0	0	0	0	0	0	1	2	2
8 75	100	50	0	11	1	0	0	0	0	0	1	2	2
9 00	71	50	0	11	1	0	0	0	0	0	1	2	2
9 25	130	50	0	11	1	0	0	0	0	0	1	2	2
9 50	83	50	0	11	1	0	0	0	0	0	1	2	2
9 75	18	50	0	11	0	0	0	0	0	0	1	2	2
10 00	8	50	0	11	0	0	0	0	0	0	1	2	2
10 25	9	50	0	11	1	0	0	0	0	0	1	2	2
10 50	9	50	0	11	1	0	0	0	0	0	1	2	2
10 75	7	50	0	11	0	0	0	0	0	0	1	2	2
11 00	8	50	0	11	0	0	0	0	0	0	1	2	2
11 25	16	50	0	11	1	0	0	0	0	0	1	2	2
11 50	24	50	0	11	1	0	0	0	0	0	1	2	2
11 75	49	50	0	11	1	0	0	0	0	0	1	2	2
12 00	17	50	0	11	0	0	0	0	0	0	1	2	2
12 25	9	50	0	11	0	0	0	0	0	0	1	2	2
12 50	6	50	0	11	0	0	0	0	0	0	1	2	2

UCSF10 TEAM 2, FEMALE-24, REMOVE-2 WISDOM TEETH

TIME MIN	CONC PPM	N2O %	PULL POKE	PROBE DIST	INJECT	ASPIR	WATER	PATIENT TALKING	DRILL	OTHER	TYPE MASK	DENT TEAM	OPER
12 75	5	50	0	11	0	0	0	0	0	0	1	2	2
13 00	6	50	0	11	0	0	0	0	0	0	1	2	2
13 25	6	50	0	11	0	0	0	0	0	0	1	2	2
13 50	5	50	0	11	0	0	0	0	0	0	1	2	2
13 75	15	50	1	11	0	1	0	0	0	0	1	2	2
14 00	11	50	1	11	0	1	0	0	0	0	1	2	2
14 25	8	50	1	11	0	1	0	0	0	0	1	2	2
14 50	12	50	1	11	0	1	0	1	0	0	1	2	2
14 75	16	50	1	11	0	1	0	0	0	0	1	2	2
15 00	10	50	1	11	0	1	0	0	0	0	1	2	2
15 25	104	50	1	11	0	1	0	0	0	0	1	2	2
15 50	166	50	1	11	0	1	0	0	0	0	1	2	2
15 75	137	50	1	11	0	1	0	0	0	0	1	2	2
16 00	91	50	1	11	0	1	0	0	0	0	1	2	2
16 25	39	50	1	11	0	1	0	0	0	0	1	2	2
16 50	17	50	1	11	0	1	0	0	0	0	1	2	2
16 75	88	50	1	11	0	1	0	0	0	0	1	2	2
17 00	70	50	1	11	0	1	0	0	0	0	1	2	2
17 25	55	50	1	11	0	1	0	0	0	0	1	2	2
17 50	42	50	1	11	0	1	0	0	0	0	1	2	2
17 75	20	50	0	11	0	1	1	1	0	1	1	2	2
18 00	16	50	0	11	0	1	1	0	0	1	1	2	2
18 25	32	50	0	11	0	1	0	1	0	1	1	2	2
18 50	82	50	0	11	0	0	0	0	0	1	1	2	2
18 75	28	50	0	11	0	0	0	0	0	1	1	2	2
19 00	12	50	0	11	0	0	0	0	0	1	1	2	2
19 25	6	50	0	11	0	1	0	0	0	1	1	2	2
19 50	4	50	0	11	0	1	0	0	0	1	1	2	2
19 75	4	50	0	11	0	1	0	0	0	1	1	2	2
20 00	33	50	0	11	0	1	0	0	0	1	1	2	2
20 25	40	50	0	11	0	1	0	0	0	1	1	2	2
20 50	15	50	0	11	0	1	0	0	0	1	1	2	2
20 75	14	50	0	11	0	1	0	0	0	1	1	2	2
21 00	13	50	0	11	0	1	0	0	0	1	1	2	2
21 25	14	50	0	11	0	1	0	0	0	1	1	2	2
21 50	9	50	0	11	0	1	0	0	0	1	1	2	2
21 75	9	50	0	11	0	0	0	0	0	1	1	2	2
22 00	8	50	0	11	0	0	0	0	0	1	1	2	2
22 25	9	50	0	11	0	1	0	0	0	1	1	2	2
22 50	13	50	0	11	0	1	0	0	0	1	1	2	2
22 75	8	50	0	11	0	1	0	0	0	1	1	2	2
23 00	8	50	0	11	0	1	0	0	0	1	1	2	2
23 25	16	50	0	11	0	1	0	0	0	1	1	2	2
23 50	15	50	1	11	0	0	0	0	0	0	1	2	2
23 75	127	50	1	11	0	0	0	0	0	0	1	2	2
24 00	73	50	1	11	0	0	0	0	0	0	1	2	2
24 25	24	50	1	11	0	0	0	0	0	0	1	2	2
24 50	28	50	1	11	0	1	0	0	0	0	1	2	2
24 75	27	50	1	11	0	0	0	0	0	0	1	2	2
25 00	20	50	1	11	0	0	0	0	0	0	1	2	2

UCSF10 TEAM 2, FEMALE-24, REMOVE-2 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
25 25	13	50	1	11	0	0	0	0	0	0	1	2	2
25 50	22	50	1	11	0	1	0	0	0	0	1	2	2
25 75	29	50	1	11	0	1	0	0	0	0	1	2	2
26 00	11	50	1	11	0	1	0	0	0	0	1	2	2
26 25	20	50	1	11	0	1	0	0	0	0	1	2	2
26 50	37	50	1	11	0	1	0	0	0	0	1	2	2
26 75	28	50	1	11	0	1	0	0	0	0	1	2	2
27 00	6	50	1	11	0	1	0	0	0	0	1	2	2
27 25	31	50	0	11	0	1	1	0	0	1	1	2	2
27 50	28	50	0	11	0	1	1	0	0	1	1	2	2
27 75	10	50	0	11	0	1	1	0	0	1	1	2	2
28 00	7	50	0	11	0	1	0	0	0	1	1	2	2
28 25	7	50	0	11	0	0	0	0	0	1	1	2	2
28 50	6	50	0	11	0	0	0	0	0	1	1	2	2
28 75	6	50	0	11	0	0	0	0	0	1	1	2	2
29 00	8	50	0	11	0	0	0	0	0	1	1	2	2
29 25	6	50	0	11	0	0	0	0	0	1	1	2	2
29 50	6	50	0	11	0	0	0	0	0	1	1	2	2
29 75	24	50	0	11	0	1	0	0	0	1	1	2	2
30 00	15	50	0	11	0	0	0	0	0	1	1	2	2
30 25	19	50	0	11	0	0	0	0	0	1	1	2	2
30 50	11	50	0	11	0	1	0	0	0	1	1	2	2
30 75	8	50	0	11	0	0	0	0	0	1	1	2	2
31 00	7	50	0	11	0	1	0	0	0	1	1	2	2
31 25	9	50	0	11	0	0	0	0	0	1	1	2	2
31 50	34	50	0	11	0	0	0	0	0	1	1	2	2
31 75	60	50	0	11	0	0	0	0	0	1	1	2	2
32 00	61	50	0	11	0	1	0	0	0	0	1	2	2
32 25	43	50	0	11	0	0	0	0	0	0	1	2	2
32 50	82	0	0	11	0	0	0	0	0	0	1	2	2
32 75	37	0	0	11	0	0	0	0	0	0	1	2	2
33 00	17	0	0	11	0	0	0	0	0	0	1	2	2
33 25	12	0	0	11	0	0	0	0	0	0	1	2	2
33 50	10	0	0	11	0	0	0	0	0	0	1	2	2
33 75	11	0	0	11	0	0	0	0	0	0	1	2	2
34 00	27	0	0	11	0	0	0	0	0	0	1	2	2
34 25	23	0	0	11	0	0	0	0	0	0	1	2	2
34 50	13	0	0	11	0	0	0	0	0	0	1	2	2
34 75	6	0	0	11	0	0	0	0	0	0	1	2	2
35 00	5	0	0	11	0	0	0	0	0	0	1	2	2
35 25	5	0	0	11	0	0	0	0	0	0	1	2	2
35 50	4	0	0	11	0	0	0	0	0	0	1	2	2
35 75	3	0	0	11	0	0	0	0	0	0	1	2	2
36 00	4	0	0	11	0	0	0	0	0	0	1	2	2
36 25	4	0	0	11	0	0	0	0	0	0	1	2	2
36 50	5	0	0	11	0	0	0	0	0	0	1	2	2
36 75	8	0	0	11	0	0	0	0	0	0	1	2	2
37 00	5	0	0	11	0	0	0	0	0	0	1	2	2
37 25	3	0	0	11	0	0	0	0	0	0	1	2	2
37 50	5	0	0	11	0	0	0	0	0	0	1	2	2

UCSF10 TEAM 2, FEMALE-24, REMOVE-2 WISDOM TEETH

TIME	CONC	N2O	PULL	PROBE				PATIENT			TYPE	DENT	
MIN	PPM	%	POKE	DIST	INJECT	ASPIR	WATER	TALKING	DRILL	OTHER	MASK	TEAM	OPER
37 75	7	0	0	11	0	0	0	0	0	0	1	2	2
38 00	6	0	0	11	0	0	0	0	0	0	1	2	2
38 25	3	0	0	11	0	0	0	0	0	0	1	2	2
38 50	0	0	0	11	0	0	0	0	0	0	1	2	2

APPENDIX C

SUMMARY OF MAJOR CONTRIBUTORS FROM N_2O CONCENTRATION AND CHANGES IN N_2O CONCENTRATION BY OPERATION

RESULT :: COLUMNS IN TEAM ORDER

	UCSF1	UCSF2	UCSF3	UCSF9	UCSF10	UCSF4 GAS ON	UCSF4 GAS OFF	UCSF5	UCSF7	UCSF8	UCSF6
TEAM	1	1	2	2	2	3	3	3	3	3	4
OPERATION	3	1	1	1	2	1	1	2	5	4	1
MASK	1	1	1	1	1	1	1	1	1	2	1
N	109	157	202	247	135	61	167	115	363	185	127
START TIME (MIN)	5.75	0.25	2	2.2	4.75	GAS ON	GAS OFF	0.25	9.75	16.25	7.75
STOP TIME (MIN)	32.5	39.25	52.75	51.4	38.25	GAS ON	GAS OFF	36	100.25	62.25	39.25
NO INDEPENDENT	7	4	5	8	12	4	6	7	7	6	2
DEPENDENT VAR	LCONC	LCONC	LCONC	LCONC	LCONC	LCONC	LCONC	LCONC	LCONC	LCONC	LCONC
R SQUARE	90.21%	89.56%	82.16%	92.13%	95.24%	77.22%	79.06%	96.30%	73.82%	68.21%	97.16%
ADJUSTED R SQ	89.53%	89.29%	81.70%	91.87%	94.77%	75.62%	78.28%	96.07%	73.31%	67.14%	97.12%
MSE	2.30	2.40	3.84	0.85	0.49	4.13	3.95	0.66	7.75	4.65	0.78
ROOT MSE	1.52	1.55	1.96	0.92	0.70	2.03	1.99	0.82	2.79	2.16	0.88
NO RESID > 4 SD	3	3	4	4	2	0	1	6	0	0	2
NORMALITY OF RESID?	NO	NO	NO	NO	NO	NO	NO	NOT REJECT	NO	NO	NO
SKEWNESS	1.79	-0.08	-1.32	0.99	1.58	1.13	-1.39	3.63	0.167	-0.97	3.63
KURTOSIS	9.03	8.39	8.7	6.32	5.14	3.04	6.36	22.62	1.56	3.05	22.42
DURBIN-WATSON TEST	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1ST ORD AUTO-CORR	0.043	0.002	[illegible]	-0.019	0.117	0.06	-0.12	-0.048	-0.015	-0.015	-0.048
CONDITION BOUNDS											
LOWER	53.7	84.7	4.4	24.4	130.1	5.6	5.3	3.7	191.455	7.7	1.5
UPPER	739.5	689.2	63.6	673.6	2186.8	130.62	102.5	174.6	[illegible]	157.3	6.1
MEAN DEP VARIABLE	3.28	2.14	3.55	2.24	1.86	-1	2.69	3.33	-3.42	1.45	3.16
INTERCEPT											
STANDARDIZED COEFFI	-0.113		0.135		0.347	0	0.267		1.045		0.061
SIGN LEVEL	0.079		0.032		0.000		0.003		0.005		0.024
PARTIAL R SQ	0.31%		0.42%		1.15%	0.00%	1.21%		0.58%		0.12%
R SQ WITHOUT	89.90%		81.74%		93.99%		77.95%		73.24%		97.05%
VARIANCE INFLATION	4.16		4.53		9.63		5.88		186.64		1.53
LCONC LAG 1											
STANDARDIZED COEFFI	0.861	0.690	0.631	0.982	0.722	0.9273	0.563	0.949	0.700	0.512	0.960
SIGN LEVEL	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
PARTIAL R SQ	19.28%	10.82%	11.34%	6.50%	3.61%	21.22%	7.7%	13.27%	27.97%	13.65%	60.34%
R SQ WITHOUT	71.93%	78.75%	71.82%	83.63%	91.63%	57.60%	71.77%	83.03%	45.85%	54.55%	36.82%
VARIANCE INFLATION	3.33	4.4	3.65	11.24	14.45	4.27	4.34	6.77	1.76	1.92	1.53
LCONC LAG 2											
STANDARDIZED COEFFI				-0.402	-0.276	-0.171	0.224				
SIGN LEVEL				0.0001	0.0002	0.1356	0.12				
PARTIAL R SQ				0.79%	0.57%	0.72%	1.19%				
R SQ WITHOUT				91.35%	94.67%	76.50%	77.98%				
VARIANCE INFLATION				24.39	9.75	3.96	4.21				
LCONC LAG 3											
STANDARDIZED COEFFI			0.095	0.32167				0.115			
SIGN LEVEL			0.0508	0.0001				0.0289			
PARTIAL R SQ			0.26%	0.92%				0.17%			
R SQ WITHOUT			81.89%	91.21%				96.14%			
VARIANCE INFLATION			3.47	11.27				8.25			
NO											
STANDARDIZED COEFFI					0.693						
SIGN LEVEL					0.0004						
PARTIAL R SQ					0.52%						
R SQ WITHOUT					94.72%						
VARIANCE INFLATION					91.92						

RESULT : COLUMNS IN TEAM ORDER

	UCSF1	UCSF2	UCSF3	UCSF9	UCSF10	UCSF4 GAS ON	UCSF4 GAS OFF	UCSF5	UCSF7	UCSF8	UCSF6
N2O LAG 1											
STANDARDIZED COEFFI		0.745	-0.115		-0.439		-0.074			0.662	
SIGN LEVEL		0.0020	0.3561		0.1275		0.0530			0.0081	
PARTIAL R SQ		0.62%	0.33%		1.19%		0.49%			5.92%	
R SQ WITHOUT		88.88%	89.02%		95.05%		78.57%			62.29%	
VARIANCE INFLATION		82.13	2.97		266.66		1.12			7.40	
N2O LAG 2											
STANDARDIZED COEFFI	0.829	-0.462									
SIGN LEVEL	0.000	0.057									
PARTIAL R SQ	1.44%	0.25%									
R SQ WITHOUT	88.76%	89.31%									
VARIANCE INFLATION	47.46	84.67									
N2O LAG 3											
STANDARDIZED COEFFI	-0.561										
SIGN LEVEL	0.015										
PARTIAL R SQ	0.59%										
R SQ WITHOUT	89.07										
VARIANCE INFLATION	53.33										
PROBE											
STANDARDIZED COEFFI				0.085				-0.087		-0.525	
SIGN LEVEL				0.0037				0.0265		0.0001	
PARTIAL R SQ				0.28%				0.17%		2.96%	
R SQ WITHOUT				93.25%				96.13%		65.25%	
VARIANCE INFLATION				3.52				4.42		9.68	
PROBE LAG 1											
STANDARDIZED COEFFI								-0.087	-1.168		
SIGN LEVEL								0.0265	0.0008		
PARTIAL R SQ								0.17%	6.84%		
R SQ WITHOUT								96.13%	72.98%		
VARIANCE INFLATION								4.42	191.46		
OTHER											
STANDARDIZED COEFFI	0.096										
SIGN LEVEL	0.657										
PARTIAL R SQ	0.08%										
R SQ WITHOUT	89.63%										
VARIANCE INFLATION	1.72										
OTHER LAG 1											
STANDARDIZED COEFFI					-0.137						
SIGN LEVEL					0.3147						
PARTIAL R SQ					1.24%						
R SQ WITHOUT					95.40%						
VARIANCE INFLATION					7.93						
OTHER LAG 2		-0.0641									
STANDARDIZED COEFFI		-0.056			-0.125						
SIGN LEVEL		0.6414			0.3724						
PARTIAL R SQ		0.29%			1.10%						
R SQ WITHOUT		89.27%			95.13%						
VARIANCE INFLATION		1.19			14.91						
OTHER LAG 3											
STANDARDIZED COEFFI	-0.168				0.118						
SIGN LEVEL	0.011				0.447						
PARTIAL R SQ	0.66%				0.16%						
R SQ WITHOUT	89.55%				95.09%						
VARIANCE INFLATION	1.76				8.83						

RESULT COLUMNS IN TERM ORDER

	UCSF1	UCSF2	UCSF3	UCSF4	UCSF17	UCSF4 GAS ON	UCSF4 GAS OFF	UCSF5	UCSF7	UCSF8	UCSF6
PATIENT TALK											
STANDARDIZED COEFFI			-0.044	-0.044							
SIGN LEVEL			0.1616	0.0722							
PARTIAL R SQ			0.18%	0.15%							
R SQ WITHOUT			81.93%	81.98%							
VARIANCE INFLATION			1.06	1.16							
PATIENT TALK LAG 2											
STANDARDIZED COEFFI				-0.094				0.6465			
STANDARDIZED COEFFI				-0.094				0.641			
SIGN LEVEL				0.0001				0.0079			
PARTIAL R SQ				0.86%				0.26%			
R SQ WITHOUT				91.28%				96.05%			
VARIANCE INFLATION				1.03				1.59			
PATIENT TALK LAG 3											
STANDARDIZED COEFFI	-0.388				0.047			-0.052			
SIGN LEVEL	0.0004				0.0215			0.0308			
PARTIAL R SQ	3.75%				0.21%			0.26%			
R SQ WITHOUT	89.45%				95.03%			96.05%			
VARIANCE INFLATION	1.3				1.05			1.61			
INJECTION LAG 1											
STANDARDIZED COEFFI								-0.0348			
SIGN LEVEL								0.0840			
PARTIAL R SQ								0.16%			
R SQ WITHOUT								96.20%			
VARIANCE INFLATION								1.17			
INJECTION LAG 3											
STANDARDIZED COEFFI					-0.581	-0.151		-0.0348			
SIGN LEVEL					0.015%	0.0402		0.0840			
PARTIAL R SQ					0.23%	1.7a%		0.16%			
R SQ WITHOUT					95.09%	75.46%		96.20%			
VARIANCE INFLATION					1.44	1.29		1.17			
DRILL											
STANDARDIZED COEFFI								0.027			
SIGN LEVEL								0.149			
PARTIAL R SQ								0.14%			
R SQ WITHOUT								96.17%			
VARIANCE INFLATION								1.02			
DRILL LAG 1											
STANDARDIZED COEFFI										0.690	
SIGN LEVEL										0.044	
PARTIAL R SQ										3.73%	
R SQ WITHOUT										67.48%	
VARIANCE INFLATION										1.11	
DRILL LAG 2											
STANDARDIZED COEFFI								0.037	-0.019		
SIGN LEVEL								0.049	0.599		
PARTIAL R SQ								0.14%	0.04%		
R SQ WITHOUT								96.177	72.987		
VARIANCE INFLATION								1.02	1.79		
PULL OR POKE											
STANDARDIZED COEFFI									0.762		
SIGN LEVEL									0.008		
PARTIAL R SQ									0.52%		
R SQ WITHOUT									73.36%		
VARIANCE INFLATION									1.12		
PULL OR POKE LAG 2											
STANDARDIZED COEFFI					-0.078						
SIGN LEVEL					0.049						
PARTIAL R SQ					0.17%						
R SQ WITHOUT					95.07%						
VARIANCE INFLATION					3.66						

RESULT :: COLUMNS IN TERM ORDER

	UCSF1	UCSF2	UCSF3	UCSF9	UCSF10	UCSF4 GAS ON	UCSF4 GAS OFF	UCSF5	UCSF7	UCSF8	UCSF6
PULL OR POKE LAG 3											
STANDARDIZED COEFFI							0.097		-0.106		
SIGN LEVEL							0.041		0.00[illegible]		
PARTIAL R SQ							0.55%		[illegible].93%		
R SQ WITHOUT							78.51%		72.89%		
VARIANCE INFLATION							1.69		1.21		
ASPIRATE											
STANDARDIZED COEFFI				-0.156							
SIGN LEVEL				0.041							
PARTIAL R SQ				0.14%							
R SQ WITHOUT				91.95%							
VARIANCE INFLATION				15.19							
ASPIRATE LAG 1											
STANDARDIZED COEFFI							-0.212				
SIGN LEVEL							0.009				
PARTIAL R SQ							0.92%				
R SQ WITHOUT							78.14%				
VARIANCE INFLATION							4.85				
ASPIRATE LAG 2											
STANDARDIZED COEFFI					0.077	-0.195			0.059		
SIGN LEVEL					0.024	0.043			0.030		
PARTIAL R SQ					0.20%	3.75%			0.35%		
R SQ WITHOUT					95.04%	73.47%			73.47%		
VARIANCE INFLATION					2.92	1.017			1.12		
ASPIRATE LAG 3											
STANDARDIZED COEFFI				0.194						0.3813	
SIGN LEVEL				0.009						0.000	
PARTIAL R SQ				0.24%						2.87%	
R SQ WITHOUT				91.89%						65.34%	
VARIANCE INFLATION				15.81						5.07	
WATER LAG 2											
STANDARDIZED COEFFI										-0.105	
SIGN LEVEL										0.016	
PARTIAL R SQ										1.06%	
R SQ WITHOUT										67.15%	
VARIANCE INFLATION										1.53	
INTERCEPT											
STANDARDIZED COEFFI											
SIGN LEVEL											
PARTIAL R SQ											
R SQ WITHOUT											
VARIANCE INFLATION											
INTERCEPT											
STANDARDIZED COEFFI											
SIGN LEVEL											
PARTIAL R SQ											
R SQ WITHOUT											
VARIANCE INFLATION											
INTERCEPT											
STANDARDIZED COEFFI											
SIGN LEVEL											
PARTIAL R SQ											
R SQ WITHOUT											
VARIANCE INFLATION											